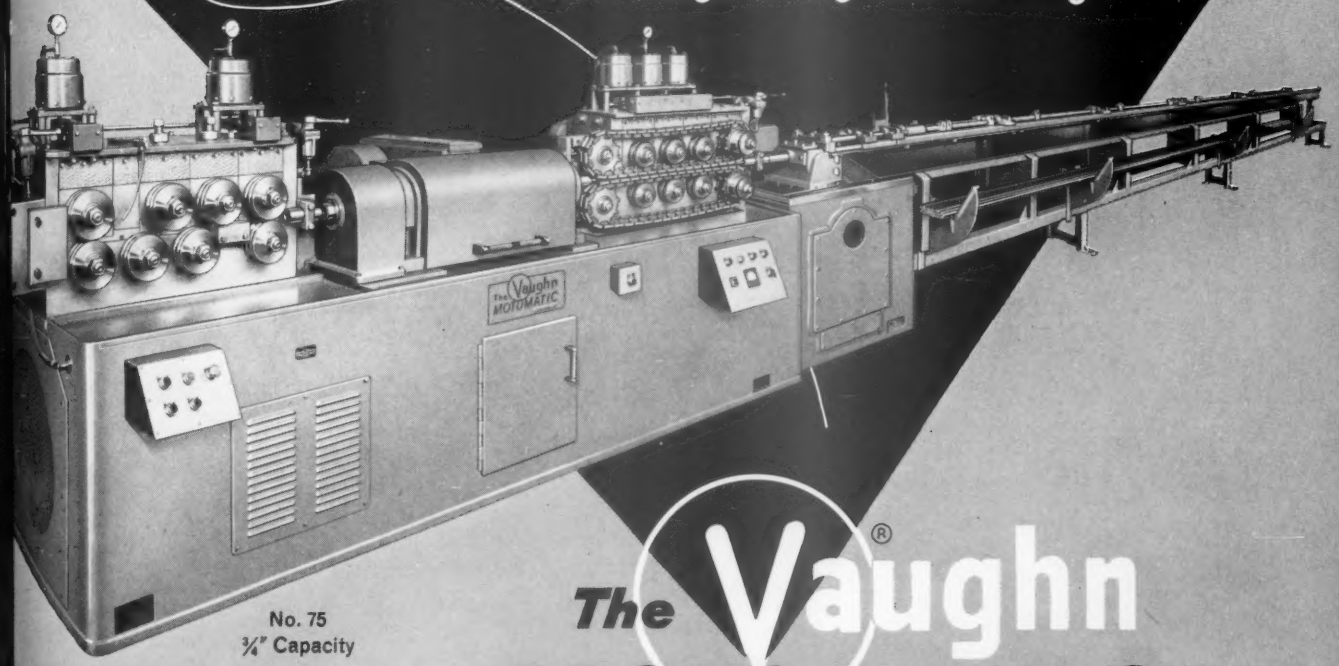
*Announcing* AN IMPORTANT *NEW* DEVELOPMENT
in Wire Straightening and Cutting . . .




No. 75
¼" Capacity

# The Vaughn® MOTOMATIC

- **SAVES** *Wire*
- **REDUCES** *Labor Cost*
- **ELIMINATES** *Twist*
- **LESSENS** *Operator Fatigue*

*All-new, all-through.* The Vaughn MOTOMATIC'S many advanced design features include an adjustable-center straightener arbor to increase size range . . . an electric variable speed drive, handling up to 300 ft per min . . . a caterpillar chain feed which grips wire without distortion, passes entire coil through machine . . . and a flying shear cut-off synchronized with wire feed. Result: fast, efficient delivery of uniform lengths of straight, precision-cut wire. *Write for New Bulletin.*

**The VAUGHN MACHINERY COMPANY** CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

*Naturally,*

# Lamson & Sessions Expansion Includes Lee Wilson Annealing Furnaces

When the records are checked, leading rod and wire users the world over just naturally turn to Lee Wilson for the latest in annealing and spheroidizing equipment. That's the way it was with Lamson & Sessions Co. when it was decided to expand their Cleveland operations. They had used Lee Wilson furnaces for years, and their records satisfied them they had the finest.

Lee Wilson engineers suggested their new 114″ diameter high-convection furnaces that were proving so successful in other plants for processing 3 stems of rod coils per charge. Lamson & Sessions agreed and ordered two furnaces and four bases.

Initial results: Lamson & Sessions today is getting a finer, more uniform anneal and production rates have jumped to a record high.

If you're considering new rod or wire annealing equipment, be sure to talk to a Lee Wilson engineer about these great new 114″ furnaces.

Lee Wilson* ENGINEERING COMPANY, INC.
20003 LAKE ROAD • CLEVELAND 16, OHIO

HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNACES

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APRIL

# America's Finest Wire Draw

## REVIEWS

### Number 304

**No. 304** is a complex, medium-high titre soap.

**No. 304** does not require any *special* practices.

**No. 304** produces a *readily cleanable* lubricant film.

**No. 304** produces an excellent lubricant film for cutting nails—drawn from borax or Stancoat "L" coated rods.

**No. 304** produces an excellent lubricant film for coiling and knotting quality upholstery grade spring wire—stress relieved by Heatron Process—drawn from borax or Stancoat "L" coated rod.

**No. 304** has many *general drawing applications*.

**No. 304** is *mill-tested* and *approved*.

"Look to Standard for the Future"

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

*Cordially yours,*

Standard Industrial

COMPOUNDS CO., INC.

Member WAS

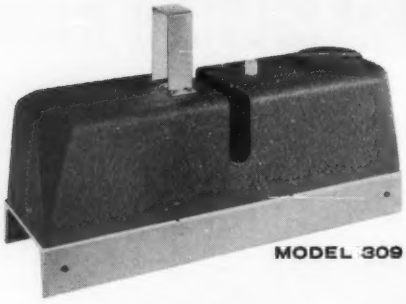
FRANKFORT, ILLINOIS

(A suburban Chicago area city)

Telephones: 2131 - 2141

# A MICROLIMIT CONTROL
## on your wire production line assures

- *optimum quality*
- *increased production*
- *closer tolerances*
- *savings in labor and materials*
- *reduced start-up wastage*



MODEL 309

MODEL 310

MICROLIMIT CONTROL offers the most reliable . . . sensitive . . . versatile *measurement and control of insulated wire dimension* available anywhere. These rugged, *noncontact gauges* provide a high degree of accuracy, *regardless of wire speed*. In many applications, MICROLIMIT CONTROLS can be mounted *right at the die* . . . can measure materials in a *highly plastic state* . . . even in hot or smoky atmospheres. Check the features and specifications below:

| | MODEL 309 | MODEL 310 |
|---|---|---|
| METHOD OF MEASUREMENT | Photoelectric pickup of obstructed light from a constant source—balanced against an unobstructed reference beam. | Photoelectric scanning by two light beams moving in tandem. Not affected by clouded atmospheres or deposits on lenses. |
| METHOD OF CONTROL | Deviation signals are fed to control console. Its output drives a conversion unit to alter capstan speed or any other production variable. Timing circuits regulate degree of correction . . . permit corrected wire to register before further control is exercised. Complete integrated systems are available. | |
| COMMON APPLICATIONS | Thermoplastic and rubber insulated wire . . . extruded tubing, rods, shapes, filaments . . . special wires. | Thermoplastic insulated cable . . . C.V. process and pan-cure rubber cable . . . extruded tubes, shapes. |
| STANDARD RANGES | .001/.025" . . . .025/.500" . . . .025/.750" | .075/1.0" . . . .075/2.0" . . . .075/3.0" |
| GAUGE SETTINGS | Direct setting with calibrated spindle . . . or, for utmost accuracy: 'zeroing' the deviation indicator on a standard reference rod. | Direct setting with digital knob control. |
| SENSITIVITY | ± 0.1 mil | ± 1.0 mil |
| RECOMMENDED LOCATIONS | Pan-cure rubber: between extruder and talc box. PVC & PE extruders: on either side of capstan. Teflon & Silicon extruders: between extruder and oven. | Generally: as close to die or extruder as desired. |

For complete information, contact your local Daystrom-Weston representative . . . or write to Industrial Gauges, West Englewood, N. J. *In Canada: Daystrom Ltd., 840 Caledonia Rd., Toronto 10, Ont. Export: Daystrom Int'l., 100 Empire St., Newark 12, N. J.*

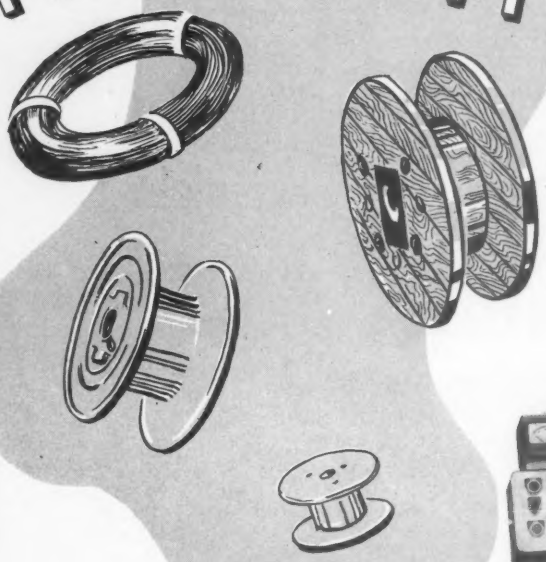
A DAYSTROM UNIT

**DAYSTROM-WESTON**

*Industrial Gauges*

# FLEXIBILITY *and Quality*

## ALL ROLLED INTO ONE MACHINE



Top this off with performance and you have the Entwistle Model DS Respooler — Coiler for winding 7½" diameter spools, coils, non-returnable or 30" diameter shipping reels at speeds up to 1200 feet per minute.

**MODEL DS** — Single upper and lower drive spindle with quick change reel adaptor.

**MODEL DSAP** — Single upper and lower drive spindle, power indexed double-head turret and interchangeable reel arbors and coiling head.

**A PACKAGING GEM VERSATILE ENOUGH TO FILL THAT GAP ANYWHERE IN YOUR PLANT**

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1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND
*Over 40 years of dependable service to the Wire Industry*

British Associates
THE KEMSON ENGINEERING CO., LTD.
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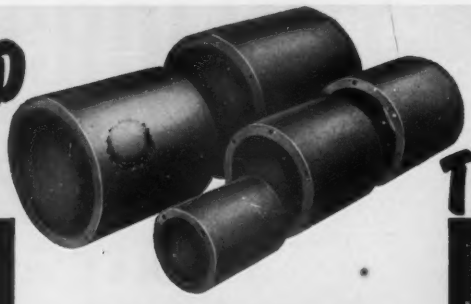
# HUBBARD TRAVERSES



EASILY ASSEMBLED IN 4 RAPID STEPS TO SAVE COST AND TIME

1 PLACE BOLTS IN REEL HEAD

2 SET HEAD ON FLOOR, BOLTS UP

3 TRAVERSE POSITIONED ON WOODEN HEAD

4 TOP HEAD LAID ON TRAVERSE AND BOLTED DOWN

HUBBARD TRAVERSES are made for nailed wood, plywood, metal bound and cast flanges, constructed of one sheet of metal—rolled, welded and flanged—in painted galvanized or plain finishes . . . easy to assemble and to repair . . . reduces damage to cable . . . increases life of reel due to rigid one piece barrel.

**Besides TRAVERSES, every type of REEL and SPOOL—returnable and non-returnable in all materials is made by HUBBARD for shipping and shop use.**

WRITE FOR PRICES AND COMPLETE INFORMATION.

**HUBBARD SPOOL DIVISION**

*The American Pulley Company*

GARRETT, INDIANA

# WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 34 April, 1959 No. 4

Designated as Official Publication By The Wire Association


## Contents


The Wire Association Regional Meeting at Boston ..... 427
The Wire Outlook ..... 435
Drive Systems for High Speed Tandem Wire Flattening Mills by P. S. Hasler and R. D. Spalding ..... 437
Teflon 100X FEP Wire and Cable Insulation: Its Place in the Fluorocarbon Family by William M. Land ..... 444
A Compound System for Wire Drawing Machines by A. T. Stoddart ..... 458
New Cellulosic Plastic Finish Improves Life And Finish of Fabricated Wire Products by Walter R. Pascoe ..... 461
Wire Kinks ..... 463 and 465
The Wire Association Regional Meeting at Houston ..... 464
Torsional Strength of Small-Diameter Wire ..... 467
The Wire Association West Coast Regional Meeting ..... 468
Soldering Chromel and Alumel Wires by Thomas A. Dickinson ..... 469
Government Wire Production Information ..... 470
Outstanding Personalities of the Wire Industry ..... 481
A Review of Recent Wire Patents ..... 490
Titanium Statistics ..... 492
Aluminum Statistics ..... 494
The Wire Association Board of Directors Meeting ..... 497
Index to Advertisers ..... 515
Where-To-Buy ..... 516-520



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THE COST
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YOU HAVE TO
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UNLIKE SOME TOOLS
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CAREW NIPPERS will continue to do this year after year; cutting efficiently long after most tools have been junked.

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**FERROUS DIVISION REGIONAL MEETING MAY 7-8 SHAMROCK HOTEL HOUSTON**

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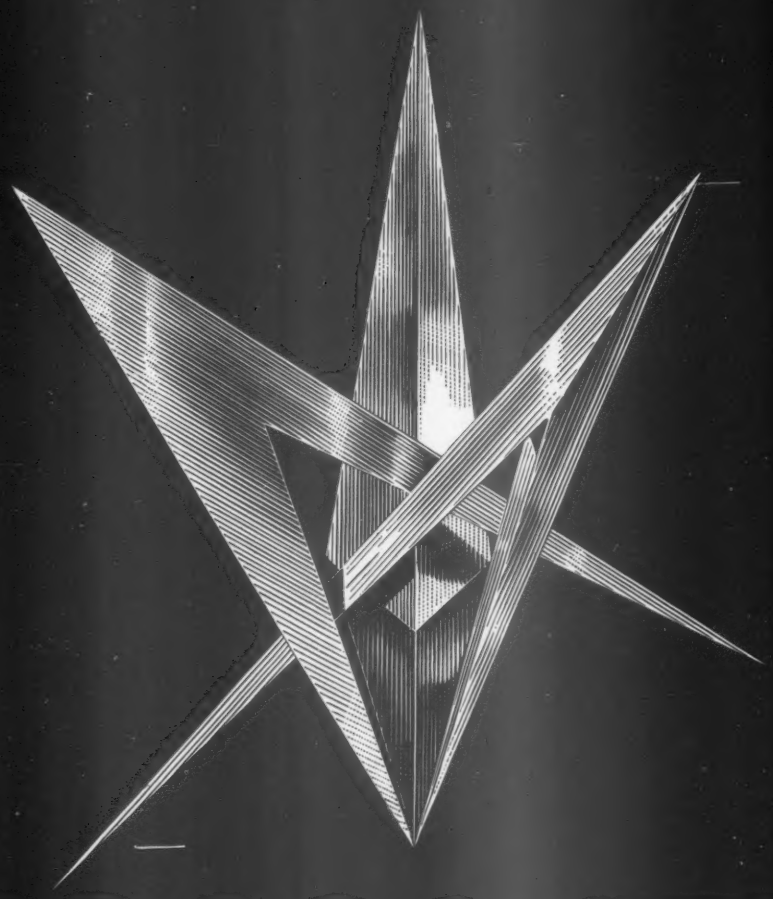

# QUALITY
## IN STAINLESS STEEL

"FLIGHT OF PROGRESS"
a stainless steel sculpture by Robert Edward Hamilton

Quality in stainless steel starts in the melt shop, where Industry Standards are met – *or missed.*

1 out of every 7 tons of stainless used in the last 15 years came from the melt shop of J&L's Stainless and Strip Division. To achieve that remarkable record as a supplier of semi-finished products, J&L set up its own standards and specifications – far more exact, more precise, *more rigid* than those in general use. Today J&L leads the industry in melting practice standards – the point where quality starts.

Chances are 1 out of 7 you have already enjoyed J&L quality in stainless, without knowing its melt shop origin. Now you can eliminate chance! Newly installed cold rolling and finishing equipment in operation at Louisville, Ohio, makes J&L the most modern *integrated* source for *finished mill products* – stainless sheet, strip, bar and wire. All of traditional J&L stainless quality.

On your next stainless steel order specify "J&L *Consistent* Quality." Don't pay for less.

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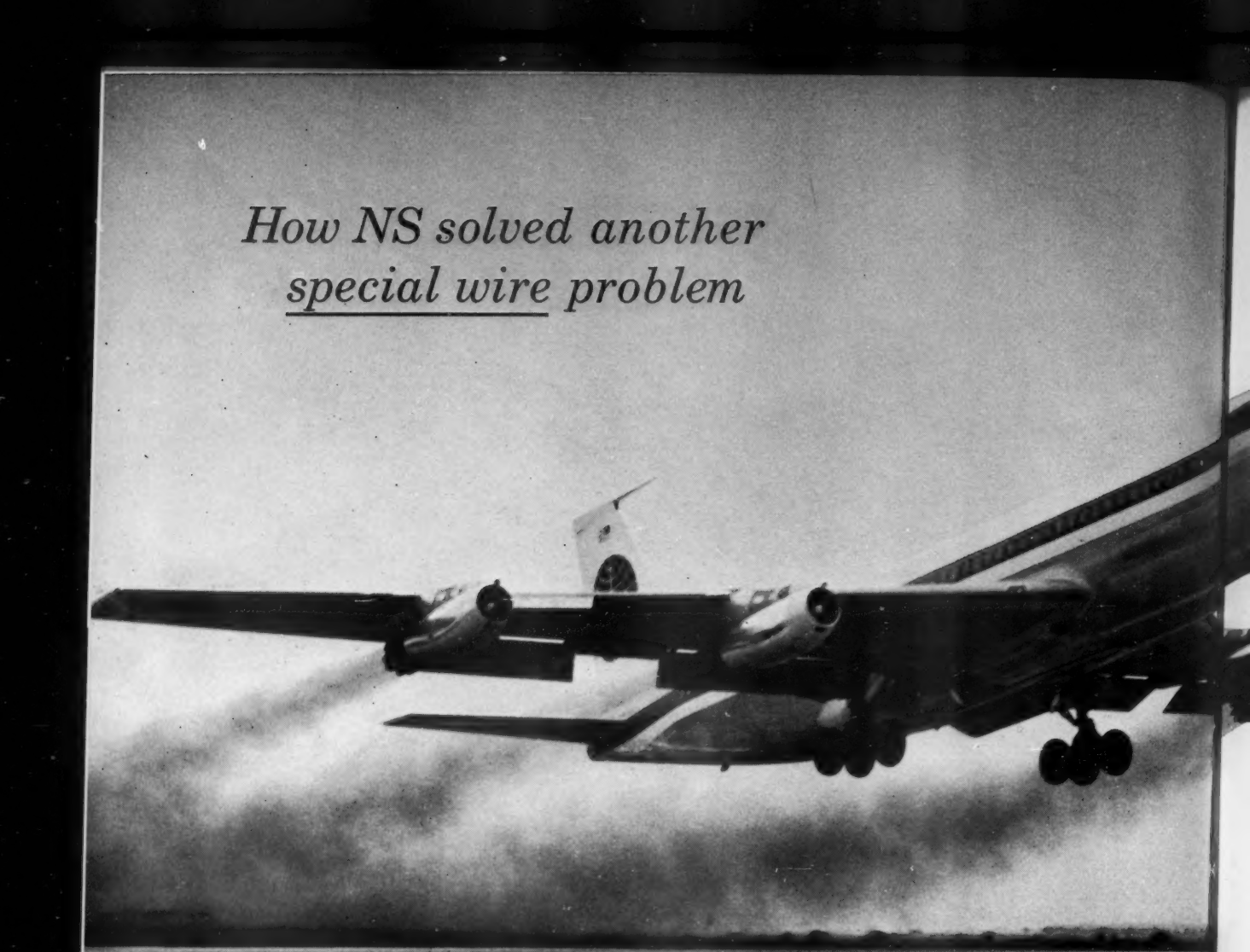
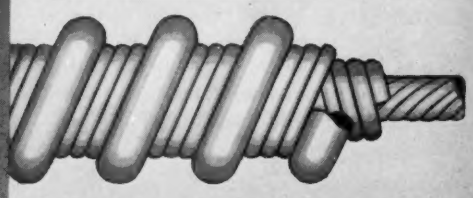
**STAINLESS**
**SHEET • STRIP • BAR • WIRE**

**Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34**

# *How NS solved another special wire problem*





**REMOTE CONTROL** cable for jet aircraft is made of layers of high-tensile National-Standard wire wound around a stranded core. Heavy outer wire provides helix or worm-gear surface for meshing with hobbed wheels.

Photo courtesy Pan American Airlines

# Special National-Standard wire helps fly new jet-liners

When the age of commercial jet transportation in the U.S. began last January, giant jet-liners inaugurated flights across the country at speeds over 600 mph. To control these new aircraft swiftly and easily requires control cables of the utmost reliability, efficiency and endurance.

NEW COMMERCIAL JET-LINERS, as well as many military aircraft, are flying now with a unique remote control cable system made of special high-tensile wire wound around a stranded core with a heavy outer wire of stainless steel wound to a pitch of 10 per inch. This outer wire acts as a helix to engage hobbed wheels within the various system control boxes.

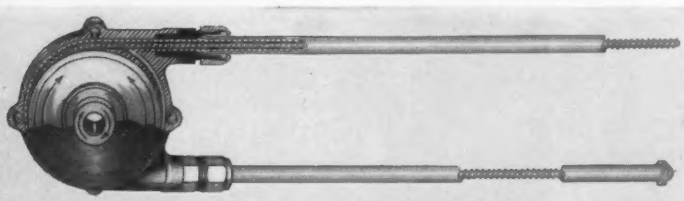
NATIONAL-STANDARD ENGINEERS worked closely with a control-cable system manufacturer to develop wire of just the proper alloy and rugged physical properties required to withstand extreme temperature and flight stress variations. National-Standard submitted wire samples to microstructural studies and physical tests to assist the customer in determining the conditions that would allow bending cable around pulleys without giving a permanent set to the cable. In addition, alloy steels with various coatings were tested to improve wear and galling resistance for various applications. The result was the development of a special stainless-steel wire that exceeded rigid specifications.

EXPERIENCED ENGINEERING HELP, of this kind, for jobs requiring high-quality wire to meet special or unique applications, is available to *you* from National-Standard. For any of the many thousands of applications where only special wire will solve the problem, let National-Standard engineers go to work for you. Write for additional information to National-Standard Company, Niles, Michigan.

*Manufacturer of specialty wire and metal products*

**NATIONAL** NS NATIONAL-STANDARD Company NILES, MICHIGAN **STANDARD**

**DIVISIONS: NATIONAL STANDARD,** Niles, Mich.; tire wire, stainless, music spring and plated wires • **WORCESTER WIRE WORKS,** Worcester, Mass.; high and low carbon specialty wires • **WAGNER LITHO MACHINERY,** Secaucus, N. J.; metal decorating equipment • **ATHENIA STEEL,** Clifton, N. J.; flat, high-carbon spring steels • **REYNOLDS WIRE,** Dixon, Ill.; industrial wire cloth • **CROSS PERFORATED METALS,** Carbondale, Pa.; decorative, commercial, and industrial perforated metals.



**FLEXIBLE CABLE** engages accurately with specially hobbed wheels housed in control boxes. This combination requires special cable wire that will not take permanent set and will provide smooth, hard bearing surface for cable inside conduit.

**NATIONAL-STANDARD** engineers made intense microstructural and tensile studies of sample wire to find exact physical properties of the alloy to meet strict aircraft control specifications.

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. . . for continuous butt welding of ferrous wire, sizes .005″ to 1.250″

. . . for continuous butt welding of non-ferrous wire, sizes .010″ through 1.000″. . .

They will tell you that Micro-Welders are

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For Welding All Types of Fine Wire Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, sizes .005″ to .020″

**Model S. E. M. T.** is equipped with a temperature-indicating device for annealing and tempering, voltage regulator and meter to compensate for voltage fluctuations, wire cutters, extra large magnifying glass, fluorescent light and extension cord. Can be supplied for bench-mounting or mounted on 4-wheel truck.

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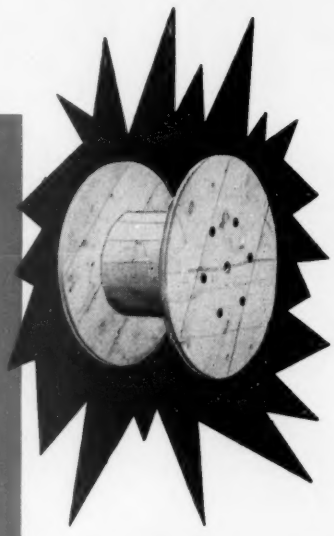

# YES

## YOU SAVE WITH NON-RETURNABLES

**LOOK AT THE ADVANTAGES**

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- **No Bookkeeping**
- **No Repair Costs**
- **No Return Freight**
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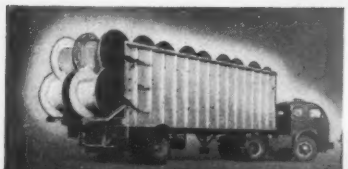
- **No More Headaches**

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST



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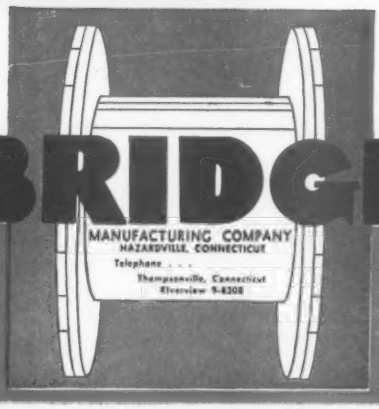
within a radius of 200 miles from the plant. Fast freight will bring you Bridge reels within a few days east of the Mississippi.



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Let us quote on your reel needs. Send us your specifications. Better yet, visit our plant and see how and why Bridge reels are made so well at so low a cost.

**WOOD REELS"**

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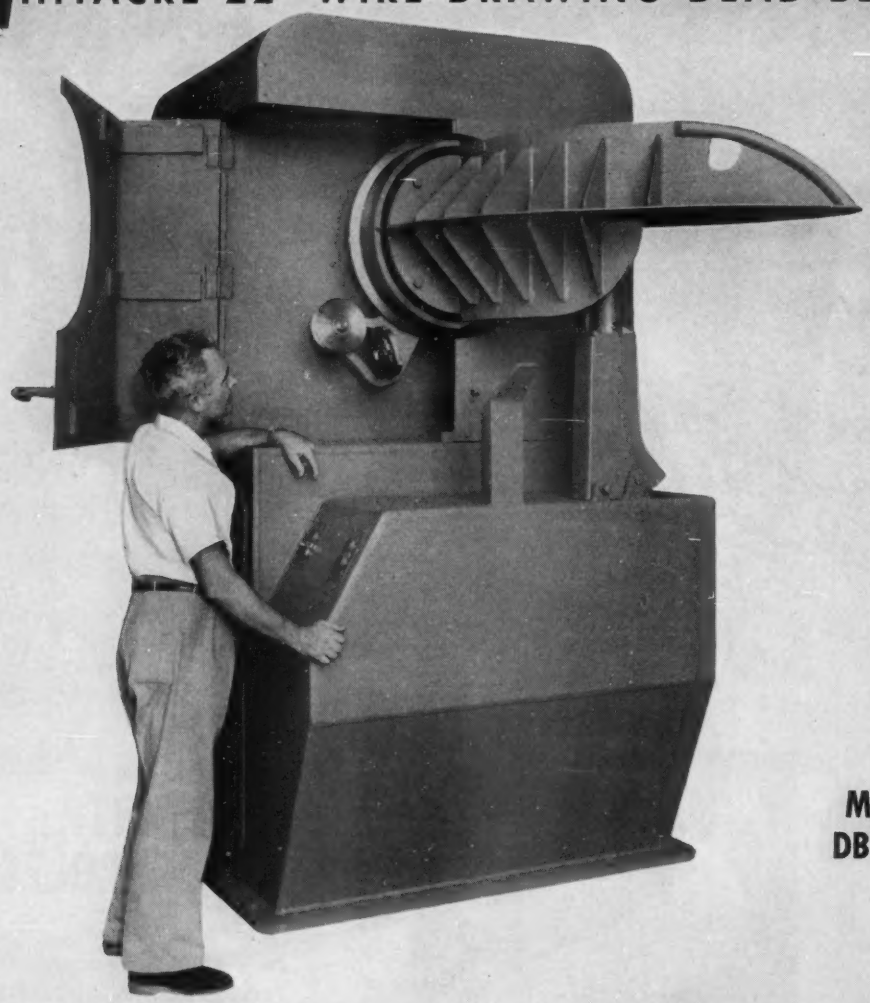

Model
DB-22A

## Continuous Production—Efficiency Approaching 100%

**Gives you these advantages**

Continuous increased production achieved by: • No down time for stripping • Permits packaging into stationary container or uninterrupted palletizing on stems • No tangling nor snarling from handling • Design simplicity. No back-gearing nor similar mechanisms • Greatly reduced floor space requirements • Dies in supplying drawing machine can be changed without stopping dead block • Accumulation type machines can be "run down" without stopping dead block • Continuous inspection and sampling • Breaks welded in production — low scrap loss • Increased production with lessened operator fatigue • Maintenance eliminated except for occasional lubrication of four main bearings and two motor bearings • Dead block can be located anywhere with wire literally piped from wire drawing machine • Extra large packages for in-process wire • Greatly reduced handling and in-plant transportation costs • Low capital investment.

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16″ Wire Drawing Dead Block, Model DB-16A • 26″ Wire Drawing Dead Block, Model DB-26A • Combination 16″ and 22″ Galvanizing or Tinning Dead Block Take-ups, Model GB-2216A • 26″ Heavy Wire Galvanizing or Tinning Dead Block Take-up, Model GB-26B.

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**GIVE US THE OPPORTUNITY TO SERVE YOU**

**WE THRIVE ON PROBLEMS**

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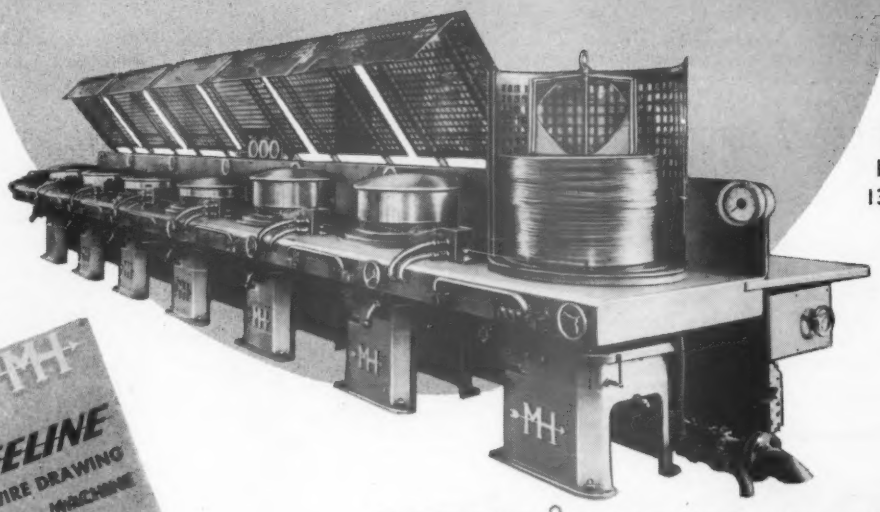
What does Western Electric approval mean?
It means passing the most exacting tests in the industry. 14202 Black can meet specifications established to assure an estimated cable service life of 30 years or longer! Western Electric tested for stress crack resistance, low gel content (to minimize localized degradation), appearance, extrusion rates, heat stability. And the testing extended over a long period of time to assure uniformity of properties.
Western Electric approval qualifies Monsanto as an additional source of black polyethylene for Bell System telephone cable jacketing applications.
For complete technical data, write to Monsanto Chemical Company, Plastics Division, Room 1257, Springfield 2, Mass.

Monsanto®

# THE BEELINE

## PRECISION WITH RUGGEDNESS

Ten Block BEELINE DG-4 Designed to Draw 3/8" Aluminum or 5/16" Copper Rod at Finishing Speeds up to 4000 f.p.m.



Seven Block BEELINE DG-4 For Max. 5/16" High Carbon Steel Rod. Max. Finishing Speed 1300 f.p.m.

BEELINE Catalogue
Write for your copy.

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SERSEAL HAS BLANKETED THE BATH in just 10 seconds. All steam, corrosive fumes and vapors are contained within bath.

## Put these 7 important Serseal advantages to work for you!...

1. Save up to 70% in heating costs.
2. Improve working conditions both from a comfort and health standpoint. Steam, heat, fumes and vapors are contained within the bath.
3. Cut warmup time. The blanket prevents heat loss.
4. Less corrosion of surrounding equipment. Corrosive fumes are retained in the bath.
5. Reduce the cost for heating elements.
6. Less exhaust equipment required. Since the bath is sealed, there is little escape of fumes and vapors. And in many cases, ventilating systems can be safely eliminated.
7. Now proving its economy, efficiency and overall satisfaction in many customer plants.

*Write today for complete information about this important new cost-reducing, work-saving chemical blanket for acid pickling baths! Address Ambler 50, Pa.*

AMCHEM

# SERSEAL

*Patent applied for

Amchem Serseal is another chemical development of **Amchem Products, Inc.** (Formerly American Chemical Paint Co.) AMBLER 31, PA. • Detroit, Mich. • St. Joseph, Mo. • Niles, Calif. • Windsor, Ont. • Amchem is a registered trademark of Amchem Products, Inc.

# *Accurate Springs* seal the goodness in

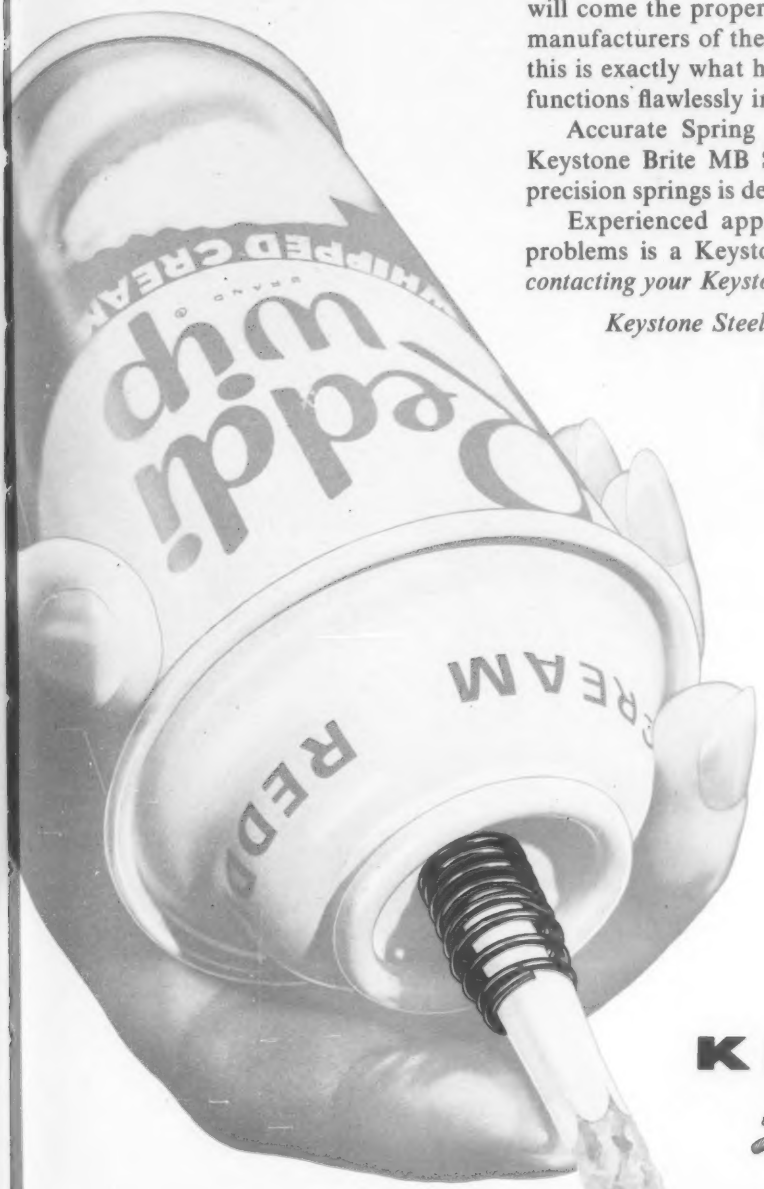
Accurate Spring Mfg. Co., Chicago, Ill. depends on Keystone Wire for millions and millions of springs that go into manufacture of "Reddi Wip" cans.

Mrs. Housewife takes it as a matter of course that when she presses the nozzle on a can of "Reddi Wip" whipped cream, out will come the proper amount of delicious whipped cream. The manufacturers of these modern dispensers have made sure that this is exactly what happens, by designing a small spring which functions flawlessly in this application.

Accurate Spring produces millions of these springs from Keystone Brite MB Spring Wire. This high production run of precision springs is dependent on absolute uniformity of the wire.

Experienced appraisal and prompt solution to your wire problems is a Keystone specialty. *This service can be yours by contacting your Keystone Representative today!*

*Keystone Steel & Wire Company, Peoria 7, Illinois*

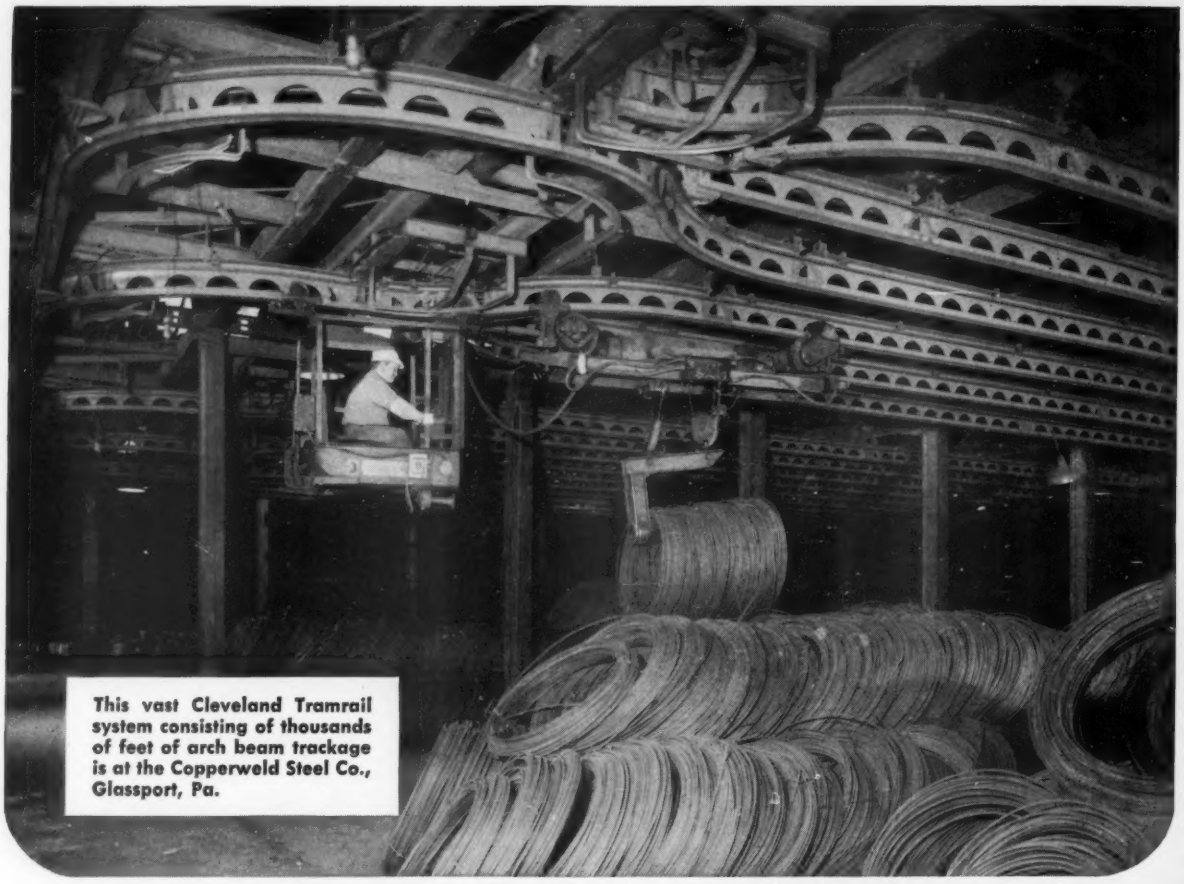



This spring must have exactly the right degree of stiffness, yet flex easily and have "sales-appeal" appearance. Keystone Wire meets these strict requirements for uniformity, correct resiliency and good plating quality.

KEYSTONE MB SPRING WIRE WIRE STUDY

**KEYSTONE**

WIRE FOR INDUSTRY



This vast Cleveland Tramrail system consisting of thousands of feet of arch beam trackage is at the Copperweld Steel Co., Glassport, Pa.

# The *Most Practical* and *Lowest Cost* Method of Handling Wire and Rod

The headline words refer to overhead materials handling equipment and are powerfully strong, we admit. Yet we do not know of one engineer who is closely connected with the industry and experienced with all methods of handling, who will disagree.

Mills, large and small, from coast to coast, in the United States and Canada, have invested many millions of dollars in Cleveland Tramrail equipment to speed their wire and rod handling. The dividends that this huge investment has made possible, because of low-cost handling, have returned the original capital many times over.

If your company does not now enjoy the many benefits of Cleveland Tramrail, we urge you to get the "low-down" on what this equipment can do for you. A nearby sales engineer will be glad to give you the details without obligation.

***GET THIS BOOK!***

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

**CLEVELAND TRAMRAIL DIVISION**
THE CLEVELAND CRANE & ENGINEERING CO.
9218 East 288 Street, Wickliffe, Ohio

**CLEVELAND TRAMRAIL**
**OVERHEAD MATERIALS HANDLING EQUIPMENT**

NATIONAL
(COLD ROLLED)
WIRE
...Ferrous or Non-ferrous,
in Coils or Straight Lengths
• Round Edge Flat Wire
• Square Edge Flat Wire
• Keystone Shaped Wire
• Oval Wire
• Half Oval Wire
• Half Round Wire
• Special Shaped Wire
• Spring Washers
• Retaining Rings
Complete Metallurgical Service
The NATIONAL
LOCK WASHER COMPANY
Precision Shaped Wire Division
NEWARK 5, NEW JERSEY
MILWAUKEE 2, WISCONSIN
NLW

National

# INDUSTRIAL PRODUCTION SHOW

of Canada

EXHIBITION PARK, TORONTO

PLAN TO VISIT THE SHUSTER EXHIBIT AT BOOTH **M-9**

MAY 4-8, 1959

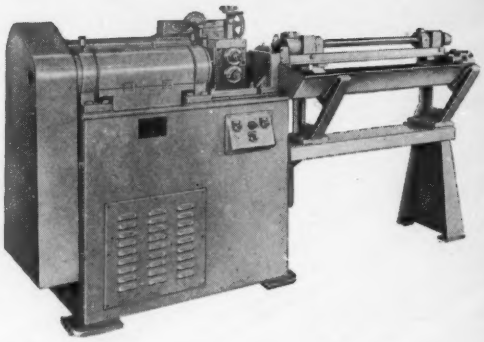
## NEW SHUSTER 2AV

ALL ELECTRIC — INFINITE VARIABLE SPEEDS
WIRE STRAIGHTENING AND CUTTING MACHINE
WILL BE DEMONSTRATED

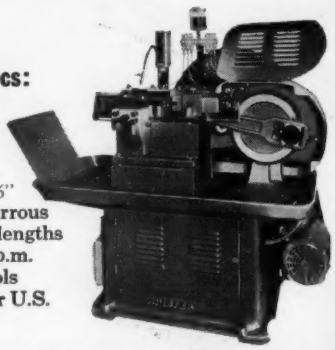
11 OUTSTANDING FEATURES LISTED BELOW

1. Higher speed five die straightening arbor, mounted on ball bearings for minimum vibration.
2. Wide range Reeves Variable Speed 50 to 200 F. P. M.
3. Interchangeable Guide Bars.
4. Totally enclosed feed roll housing with shafts mounted on Timken Bearings. Gears in oil.
5. Machine totally enclosed with guards.
6. Electric control Panel — one position operation.
7. Electric trip mechanism on target.
8. Solenoid-operated roll-type clutch.
9. Wire size range:
   1/16" to 5/16" mild steel wire.
   1/16" to 3/16" high tensile wire.
10. Correct working height.
11. Electric brake on clutch.

SINCE 1866



Also on exhibit will be the new **SHUSTER THREAD ROLLER**, which brings thread rolling well within range of the small to medium producer at a low initial investment.



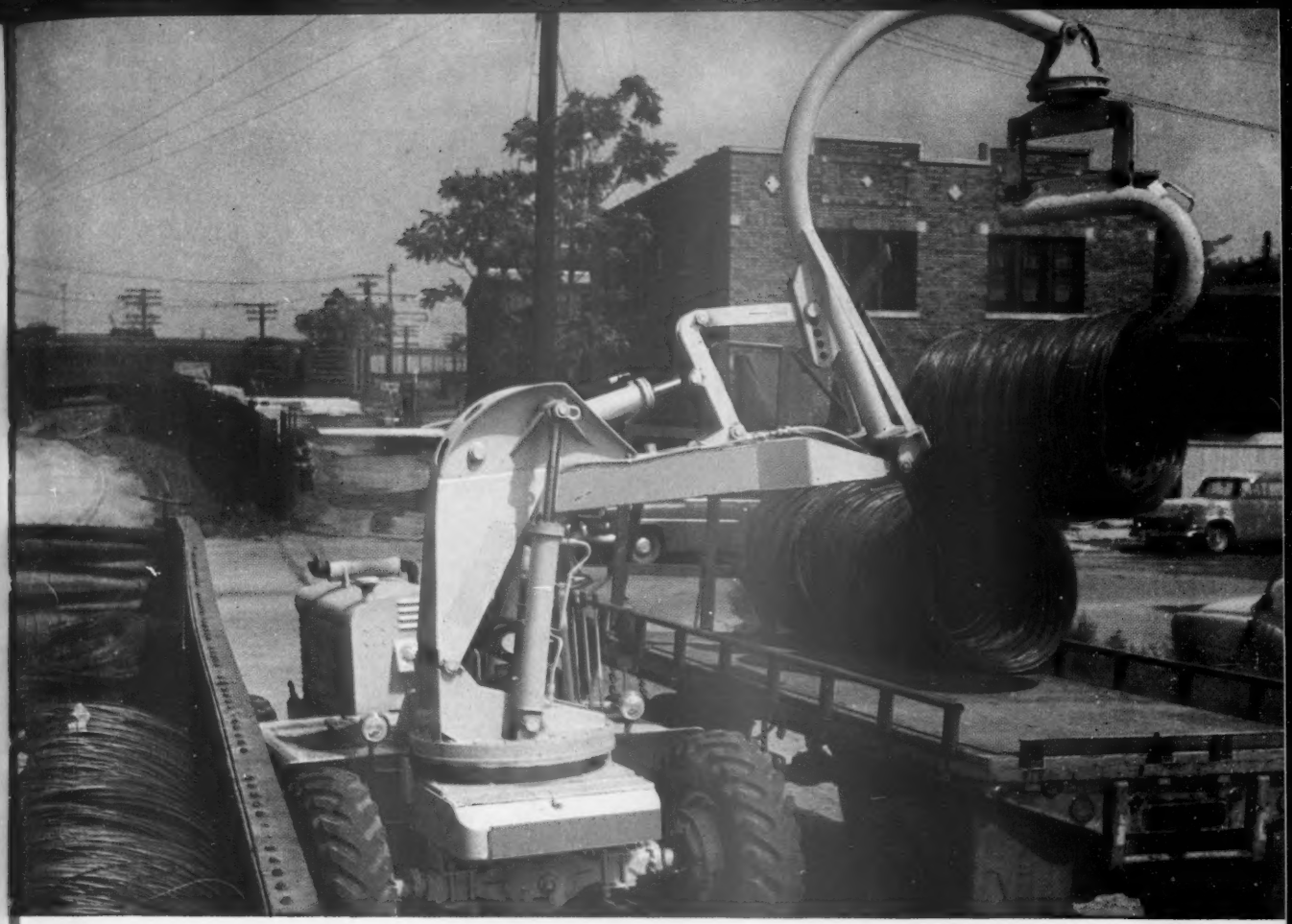
**check these specs:**

- reciprocating die type
- manual or hopper feed
- No. 6 to 5/16" dia. thread, ferrous
- 2" or 3" max. lengths
- 60 to 120 pcs p.m.
- electric controls
- 3 HP motor or U.S. Varidrive
- 4 Models

*Let us quote you! Prompt delivery.*

## METTLER MACHINE TOOL, INC.

475 BOULEVARD NEW HAVEN, CONN.



*How the Pettibone Speed Swing Loader*

# CUT WIRE HANDLING COSTS 60%

Choosing the right machine for the job has paid off big dividends for a Chicago area wire products manufacturer.

Coiled rod had been received at the plant in open rail cars which were unloaded by a three man crew with a crane. One man was needed in the rail car to hook up the coils, while another man unhooked the coils in a truck. The third man operated the crane. While this method worked, it was costly and time consuming.

A Pettibone Speed Swing demonstration convinced management that the job could be done quicker and cheaper. The Speed Swing's hydraulically controlled hook picks a load of rod out of the car and swings it over onto a trailer all in one smooth operation. The hook rotates 360° to pick up and place loads in any position. After the trailer is loaded, the Speed Swing tows it to a stockpile and unloads the coils. The only crew needed for the entire operation is the Speed Swing operator.

If you have a similar wire handling problem, we will be happy to show you how the Speed Swing can help you. Write, wire or 'phone us today, and start your savings now!

PETTIBONE

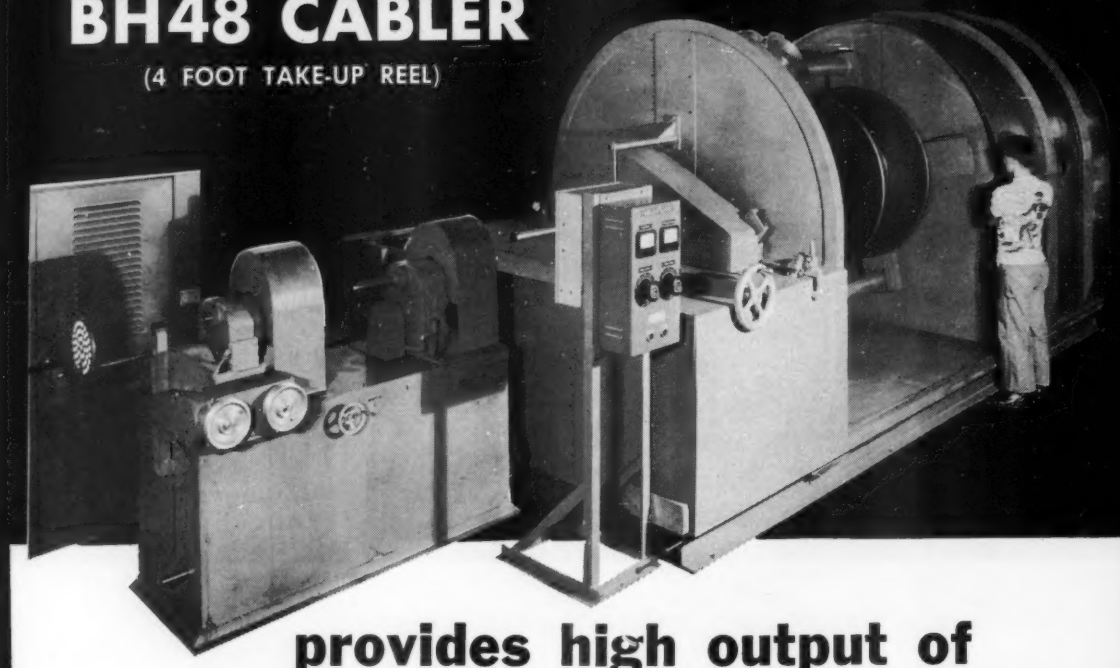
**PETTIBONE MULLIKEN CORPORATION**

**4700 West Division Street • Chicago 51, Illinois • SPaulding 2-9300**

# new! COOK

## BH48 CABLER

(4 FOOT TAKE-UP REEL)



## provides high output of quality cable at lowest cost

The Cook BH48 is truly a speed demon! At 6" lay it will produce up to 12,000 feet per hour of the highest quality cable ever. That's production! And the Cook BH48 is versatile too. Two wires . . . a hundred wires . . . or more . . . the Cook BH48 will handle any number to make cable up to 1⅛" maximum diameter. That's versatility!

Whether you twist insulated wire, uninsulated wire, or both, you can count on the Cook BH48 for economy too. It's easier to string up (because it has no capstan), easy to operate (features simplified pushbutton controls), and is available with cotton, cloth, and paper wrapping attachments.

Want more information? Write today for the complete details.

**SPECIFICATIONS**

| | |
|---|---|
| PRODUCTION: | 12,000 ft/hr at 6" lay |
| FLYER SPEED: | 400 rpm maximum |
| REEL SIZE: | 48"F x 24"T x 22" barrel x 8" bore |
| FLOOR SPACE: | 7'6" x 16'0" |
| LAY RANGE: | 1½" to 18" |
| TWIST: | Right or left hand |
| FINISHED WIRE SIZE: | 1/8" |
| WRAPPING HEAD: | Optional |
| NEUTRALIZER: | Optional |
| Also Available in 36" and Other Sizes | |

COOK

MANUFACTURING CO.

50 EAST 25th STREET, PATERSON, N. J. • ARMORY 4-6380

•

*CANADIAN AGENT*

E. V. LARSON CO., LTD., TORONTO, CANADA

•

*EUROPEAN AGENTS*

CAPAMADJIAN LE MONNIER CIE LTD., PARIS, FRANCE

KNOERZER & CO., STUTTGART, GERMANY

# VYGEN® special PVC compounds and resin

## FOR WIRE AND CABLE COATING

In addition to Vygen 120 PVC resin, there are *three* specially-formulated Vygen compounds completely tested and UL-approved for specific wire and cable applications. Available in quantities to fit your needs, each Vygen compound and resin is composed of the very finest raw materials, processed in the most modern facilities. Each is designed to do its job better, *and* to save you money. Send for generous samples, literature and technical assistance.

### VYGEN 6812 COMPOUND

UL-approved for UF-NMC cable, Type T, TW, 60°C, Oil, and 80°C appliance wire applications. May also be used as primary insulation for other cable constructions and jacketing.

### VYGEN 6035 COMPOUND

UL-approved for Type T, TW, and exposure to oil use at 60°C. This compound combines excellent physical and electrical properties with very good weather and flame resistance.

### VYGEN 9221 COMPOUND

Meets UL requirements for 90 and 105°C applications. Recommended for appliance, radio hook-up, machinery wire etc. where heat resistance and good physical properties are required.

### VYGEN 120 RESIN

UL-approved as interchangeable with other PVC resins used as wire insulating material. For fast dry-blend extruding with monomeric or polymeric plasticizers—assures lack of gelled particles, excellent heat and light stability and long life.

**TYPICAL ANALYSIS**

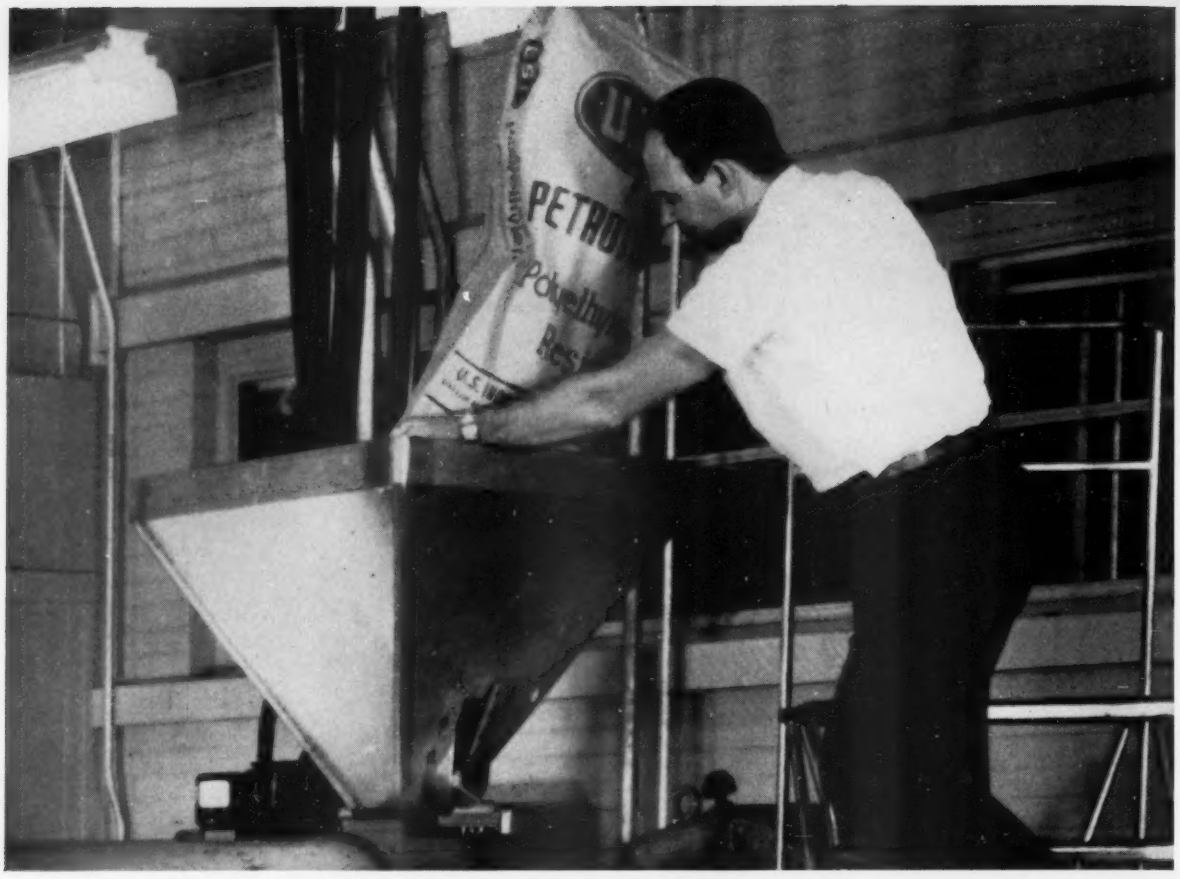
| | |
|---|---|
| Form | White Powder |
| Intrinsic Viscosity | 1.18 |
| Specific Gravity | 1.40 |
| Bulk Density, gm/cc | 0.52 |
| lbs/ft³ | 32.5 |
| Volatiles | 0.2 |

*Creating Progress Through Chemistry*

**PHYSICAL PROPERTIES OF MOLDED SPECIMENS**

| | 6812 | 6035 | 9221 |
|---|---|---|---|
| Specific Gravity at 25°C/4°C | 1.32 | 1.33 | 1.38 |
| Tensile, psi at 25°C | 2550 | 2950 | 3100 |
| Modulus at 100% Elongation, psi | 1450 | 1780 | 2150 |
| Elongation, % at 25°C | 320 | 315 | 340 |
| Hardness, Shore A, inst at 25°C<br>10 sec at 25°C | 90<br>82 | 94<br>86 | 97<br>92 |
| Brittle Point, at – 15°C | Passes | Passes | Passes |
| Volume Resistivity, ohm-cm at 25°C and 50% R. H. | $3.1 \times 10^{14}$ | $2.8 \times 10^{14}$ | $3.5 \times 10^{13}$ |

Chemical Division GENERAL
THE GENERAL TIRE & RUBBER CO.
VYGEN ®



# You charge the resin as received when you produce polyethylene-covered wire

*because polyethylene needs no blending*

Manufacturing polyethylene-covered line wire is simple. You feed the resin, as you receive it, to the extruder. There are no plasticizers, softeners, antioxidants to add. There's no prebatching, blending, milling; no vulcanizing after extrusion. Carbon black and antioxidants are already in the resin.

A complete polyethylene production program simplifies operations in other ways too. One production line can take the place of several, providing savings in equipment, floor space, maintenance and labor. Stocking only one material reduces purchasing and inventory problems.

With polyethylene, you base production on a material that has trended downward in price as capacity increased. And ample capacity for PETROTHENE® polyethylene insures continuous supplies of uniformly high-quality resin.

**Look To Tomorrow's Sales**

See how polyethylene can improve the profitability of your operations tomorrow, if not today. With other insulating costs trending upward, polyethylene can be expected to be your most profitable line wire coating in the years to come. You can prepare for those profits *by promoting polyethylene-covered line wire now*, just as U.S.I. is doing in a series of advertisements in utility magazines.

*For your customers*, polyethylene means a product that is easy to handle . . . has exceptional weather and stress-crack resistance . . . is long-lasting in service. This tough plastic covering is registering outstanding service records for power cable, communications cable, WD-1 infantry field wire, TV lead wire and many other applications.

U.S.I. PETROTHENE polyethylene resins are tailored to provide the proper balance of properties needed in different end uses. To help you choose the most suitable resin for each use, we've compiled a chart of the properties, applications and applicable specifications of PETROTHENE polyethylene compounds. This information is in a new four-page data sheet, "PETROTHENE Resins for the Wire and Cable Industry." Also available is U.S.I.'s comprehensive 100-page "PETROTHENE Polyethylene . . . A Processing Guide." Write for your copies.

**U. S. Industrial Chemicals Co.**
Division of National Distillers and Chemical Corp.
**99 Park Ave., New York 16, N. Y.**

Please send me:

☐ "PETROTHENE Resins for the Wire and Cable Industry"
☐ "PETROTHENE Polyethylene . . . a Processing Guide"

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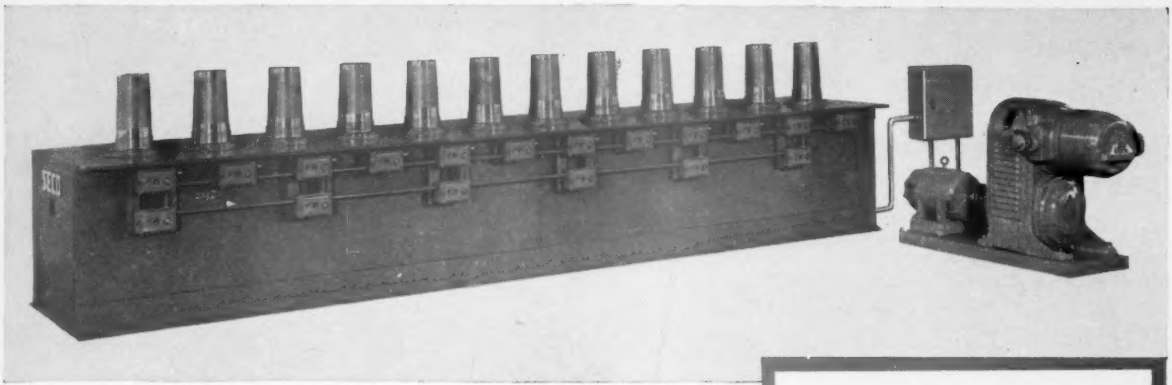
**U.S.I. INDUSTRIAL CHEMICALS CO.**
Division of National Distillers and Chemical Corp.
**99 Park Ave., New York 16, N. Y.**
*Branches in principal cities*

# SECO Fine wire TAKE-UP FRAMES

## The "last-word" in wire-winding efficiency!



- **Simplified Design and Construction**
- **Synchronized Electrical Variable Speed**
- **Noiseless, Vibrationless Running**
- **Greatly Increased Operating Capacity**

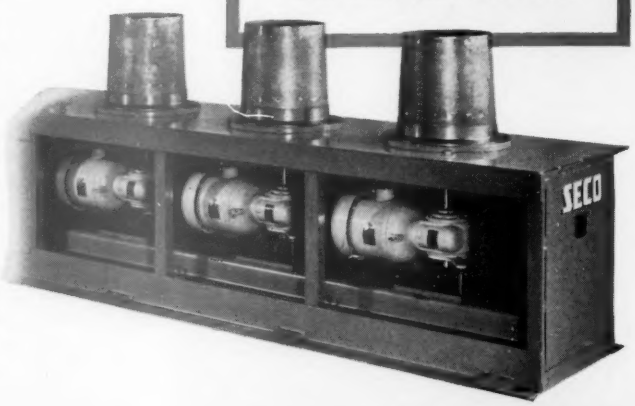
**SHOWN ABOVE:**
SECO Take-Up Frame and VARIDYNE Electrical Power Unit which provides synchronized variable speed to the multiple drives. AC current is employed throughout, and the VARIDYNE System "gears" all the drives together by electrical impulses.

**SHOWN BELOW:**
The AC squirrel-cage induction type gear motors which drive the spindle blocks through hollow bored shafts.

SECO builds take-up frames for handling fine gauge steel or non-ferrous wire on 8", 12", or 16" diameter blocks...with linear wire speeds up to 1,000 FPM or higher. Superior features include a multiple electrical drive system (alternating current) for synchronized electrical transmission of variable speed power.

This gives simultaneous speed changes to all spindle blocks, in ratios up to 5:1 or even 10:1 or higher. It provides push-button stop-start control to each of the gear motors driving each spindle block. Gone is the old bevel gearing, with manually operated clutches for starting and stopping the blocks.

SECO high production take-up frames are constructed to accommodate any number of spindles required. Frames with horizontal spindles can also be built. Call or write for complete information and data. Consultation invited—no obligation.




**STEEL EQUIPMENT COMPANY**
**P. O. BOX 737, WARRENSVILLE STATION**
**CLEVELAND 22, OHIO**

**SECO**

**Forming no-sag springs.** Pittsburgh Steel's 8 gage no-sag wire is bent into a regular no-sag spring for theater seat. Speed of operation and severe bending call for just the right combination of tensile strength and ductility.

# No-Sag Spring Pioneer Uses Pittsburgh Steel Co. Wire Because Of 'Good Quality, Service, Delivery'

The company which introduced the no-sag spring in the United States 25 years ago today uses Pittsburgh Steel Co.'s No-Sag Wire because of "good quality, service and delivery."

Since 1934, No-Sag Spring Co. of Detroit has grown to a 22-plant operation, spreading from New Jersey to California and extending to a dozen foreign countries.

No-sag springs and the special no-sag wire from which they are formed were unheard of when the late Henry Hopkes Sr., founder of the firm, obtained patent rights from the German inventor and went into business in Detroit.

Now widely used in the furniture and automobile industries, no-sag springs made necessary the development of a special hard drawn, lead patented, high tensile wire made from selected steel heats. These specifications are met handily by the skilled steelmakers and wire drawers at Pittsburgh Steel Co.

**No-sag wire has to be tailo made because of the high-spee operation it undergoes on form ing machines, many of whic were designed by No-Sag Sprin Co. engineers. Extra toughnes is required to allow twistin short lengths to make ribbo lengths. Special restriction c cast is necessary for proper co trol in forming the springs.**

Pittsburgh Steel consistently fu

ishes coils of no-sag wire with ensile strengths up to 240,000 psi or wire .192 in diameter. At the ame time, the wire is ductile enough o be wrapped on its own diameter s a mandrel without cracking or reaking.

G. L. Stine, who heads up research nd development for No-Sag Spring Co., said:

**"We have found Pittsburgh Steel wire to be of excellent uality and their service and elivery have been equally good. Pittsburgh Steel has certainly elped maintain and improve ur reputation for quality prings in the industry."**

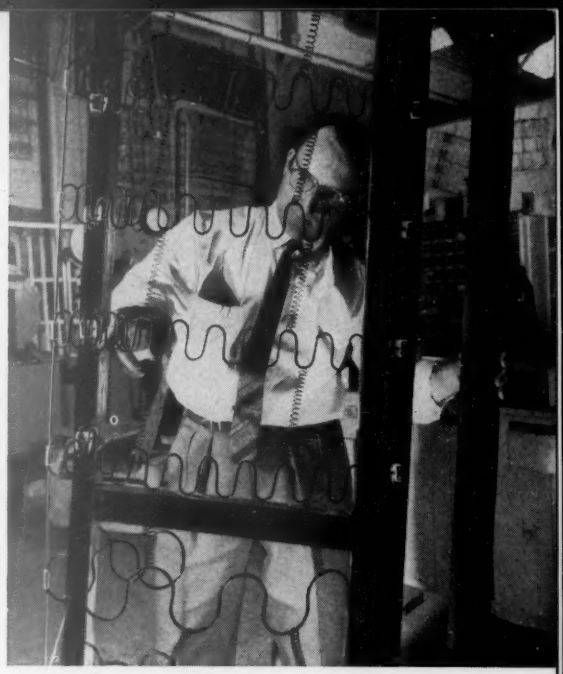
**Close Tolerances**—No-Sag pring Co. also insists that the di-meter be uniform and that the wire e free of surface defects, pipe or inks.

The company forms wire into three eneral types of no-sag springs. Pre-ise engineering at No-Sag Spring etermines the best type of spring for any application.

Regular no-sag springs have the original size and shape loop that was first developed with a loop approximately 1⅞ inches wide and a ⅞-inch space between the parallel wires. XL-No-Sag springs have an extended loop with a loop size of 1⅞ inches and 1½-inch space between parallel wires. Supr-Loop strands have a loop size of three inches wide and 1¾ inches between parallel wires.

Whether you're making no-sag springs or using one of the other grades of wire—from rope wire to cold heading wire, you'll benefit from the steelmaking and wire-drawing skill which has gone into the development of such special wires as no-sag spring wire.

You'll like the same kind of service and deliveries which Pittsburgh Steel Co. gives the No-Sag Spring Co. Bring your wire needs or coiling problems to the trained people at Pittsburgh Steel Co. today. Help is as close as your telephone. Just call the sales office nearest you. See list below.



**Experimental Department** constantly seeks new applications. This new type of day bed shows two types of no-sag springs—regular loops in top half and Supr-Loops in bottom.

**Back springs for sofa** have ends turned back on themselves to form V-Arcs.

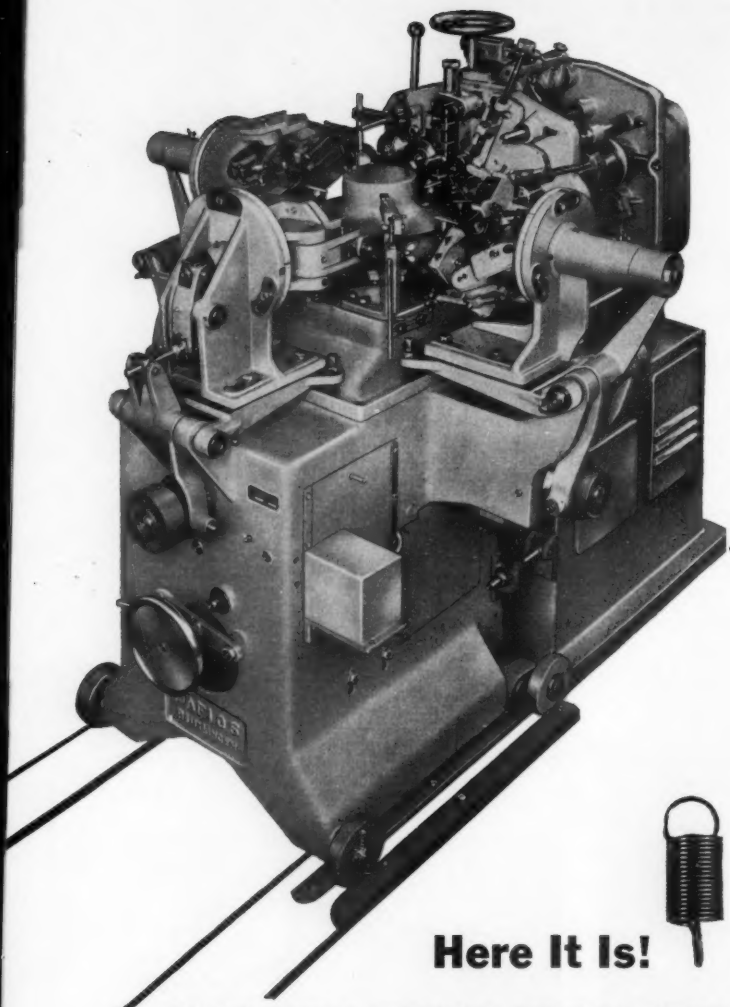
**Soft End"** for easy chair seat is made that end of spring remains free. stalled in chair, ends will be connected ng edge of seat. Resiliency of wire n be depended upon to retain shape spring. Freedom from defects in the face of the wire provides uninter-pted production on No-Sag Spring's chines . . . cuts down rejects and es from scrap.

# Pittsburgh Steel Company

**Grant Building • Pittsburgh 30, Pa.**

**DISTRICT SALES OFFICES**

| | | | | |
|---|---|---|---|---|
| Atlanta | Cleveland | Detroit | Los Angeles | Pittsburgh |
| Chicago | Dayton | Houston | New York | Tulsa |
| | | | Philadelphia | Warren, Ohio |



**AUTOMATIC SPRING COILING LOOPING MACHINE**

## Here It Is!

**THE FIRST FULLY AUTOMATIC UNIVERSAL SPRING COILING AND LOOPING MACHINE**

for the production of extension springs looped on both ends. The loops can be made parallel or at any angle to each other. The uniformity of placement of loops and length of springs far surpasses results achieved by "old fashioned" methods.

It is not only possible to produce springs with normal loops, half open loops or machine loops, but, also springs having two different styles of loops.

**THE ZO SERIES OF COILER-LOOPERS ARE AVAILABLE IN 2 MODELS:**

| | Model ZO/15 | Model ZO/30 |
|---|---|---|
| Wire diameters | .0197" to .0475" | .0394" to .118" |
| Lengths of Springs | .750" to 5½" | 1¾" to 7" |
| O. D. of Springs | .200" to ⅝" | .394" to 1" |

Production on both Models up to 40 complete springs per minute.

**WAFIOS**

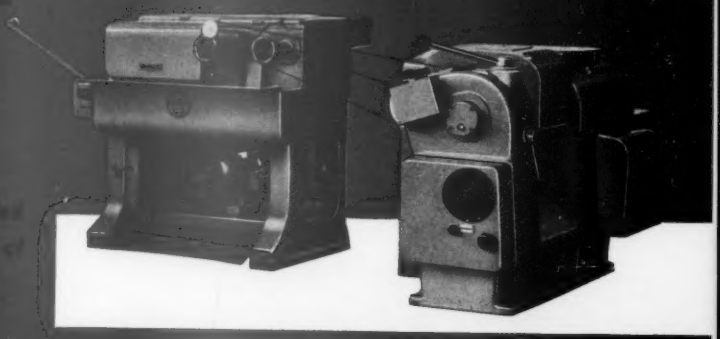
U. S. Office: WAFIOS MACHINERY CORPORATION
61 Hudson Street, Hackensack, New Jersey

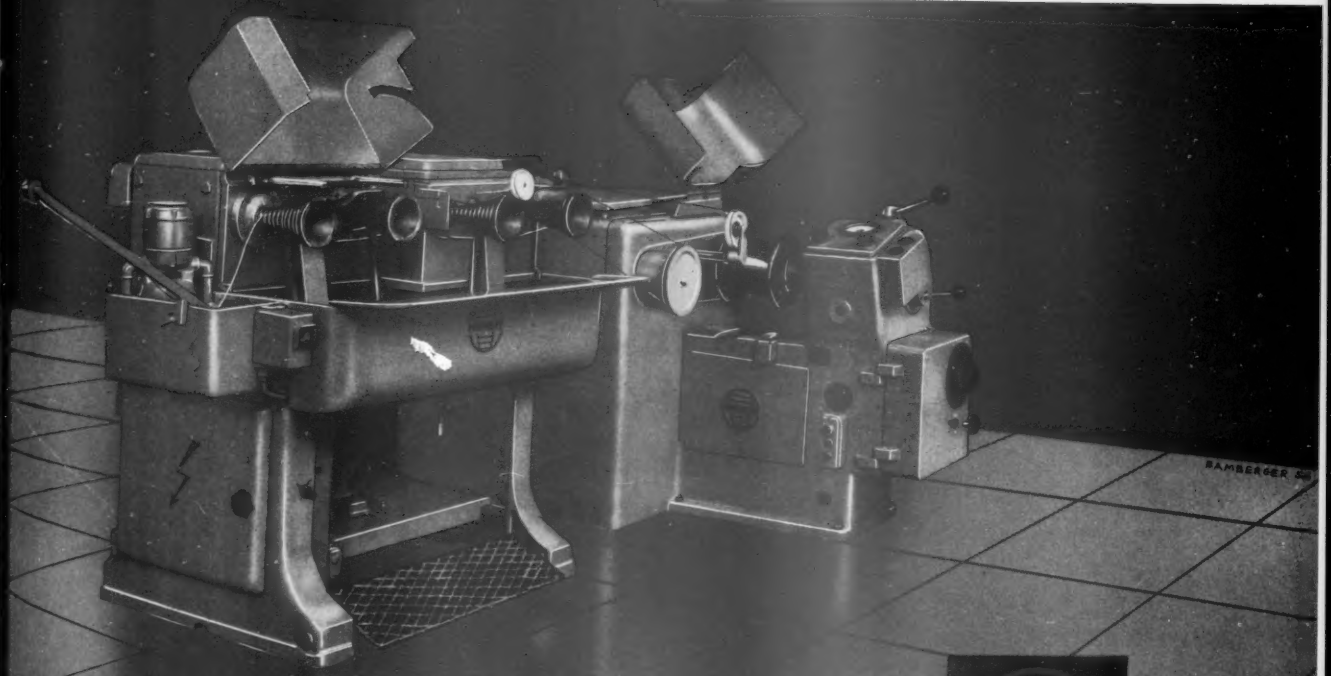
**WAFIOS MASCHINENFABRIK REUTLINGEN/GERMA**

# NIEHOFF WIRE DRAWING UNITS

for finishing sizes between BSG 35 and 40, consisting of Drawing Machine Type 110 for 13% constant area reduction and DC controlled Spooler SD 50 with incorporated Ward Leonard drive.

This synchronized single push-button controlled unit permits production of 60 lb. spools of .0031".





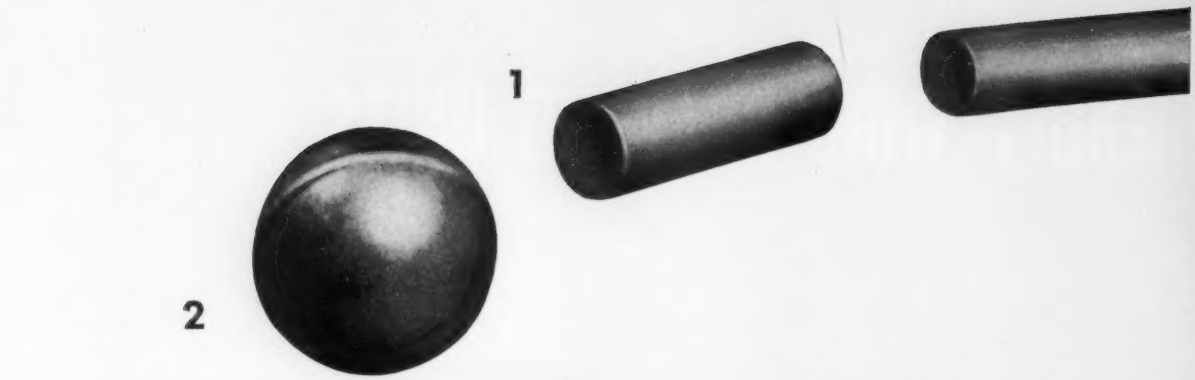
NIEHOFF

## NIEHOFF MACHINE WORKS

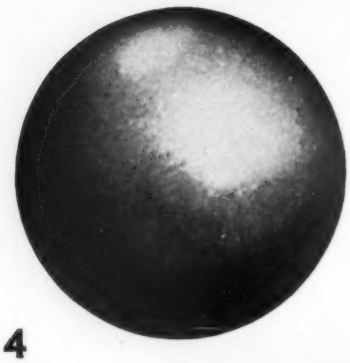
SCHWABACH NEAR NURNBERG WESTERN GERMANY

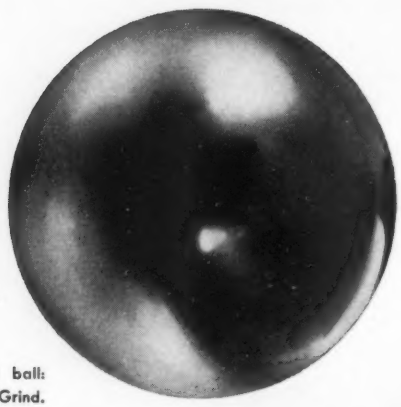
EXCLUSIVE REPRESENTATIVES FOR U.S.A., CANADA AND MEXICO

AMERICAN LAUBSCHER CORPORATION




# Making case-hardened balls from cold-heading wire




Steps in making a case-hardened ball: 1. Wire cut to size. 2. Cold-head. 3. Grind. 4. Harden and Tumble. 5. Finish.

Changing a length of straight steel wire into a precision-finished bearing ball might seem like fitting a square peg into a round hole. Yet that's the way case-hardened balls are made, and with the proper type of Bethlehem ball-quality wire the results are gratifying indeed.

The trick really lies in producing the right wire for this severe heading operation, along with the dry grinding, hardening, tumbling, and finishing steps that follow. Bethlehem cold-heading quality wire passes these tests with flying colors.

In fact, Bethlehem wire has performed consistently for a wide variety of cold-headed parts, from rivets and screws to complicated custom-headed items. You can depend on Bethlehem wire to be uniform in quality, temper, and finish. Most important, you can count on Bethlehem to furnish the *right* steel wire for your job. Let us know if we can help you with any wire problem you may have. Just call our nearest district sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
*Export distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

BETHLEHEM STEEL

**NAUGATUCK Naugapol** specially-processed SBR polymers

# DRY...like the Dust Bowl!

The Southwest's Dust Bowl at its driest is no more lacking in moisture than is rubber insulation or rubber products made from Naugapol® polymers. That's because all eight types* of these styrene-butadiene polymers are *specially-processed* for low moisture absorption.

Water-absorbing salt, generally used as a coagulant following polymerization, is eliminated in the manufacture of Naugapols. Extra straining and milling further remove all water-solubles from the dried polymers, yielding easy-processing rubbers noted for their:

- HIGH DIELECTRIC PROPERTIES
- LOW MOISTURE ABSORPTION
- LOW ASH CONTENT

These are the qualities that make Naugapol polymers so strongly preferred by manufacturers of rubber-insulated wire and cable, mechanical rubber goods and other rubber products requiring high electrical insulating qualities and excellent mechanical characteristics over a wide temperature range.

*Naugapols are made in types 1016, 1018, 1019, 1021, 1022, 1023, 1503 and 1504.

**Naugatuck Chemical**

Division of United States Rubber Company

429 N. Elm Street
Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

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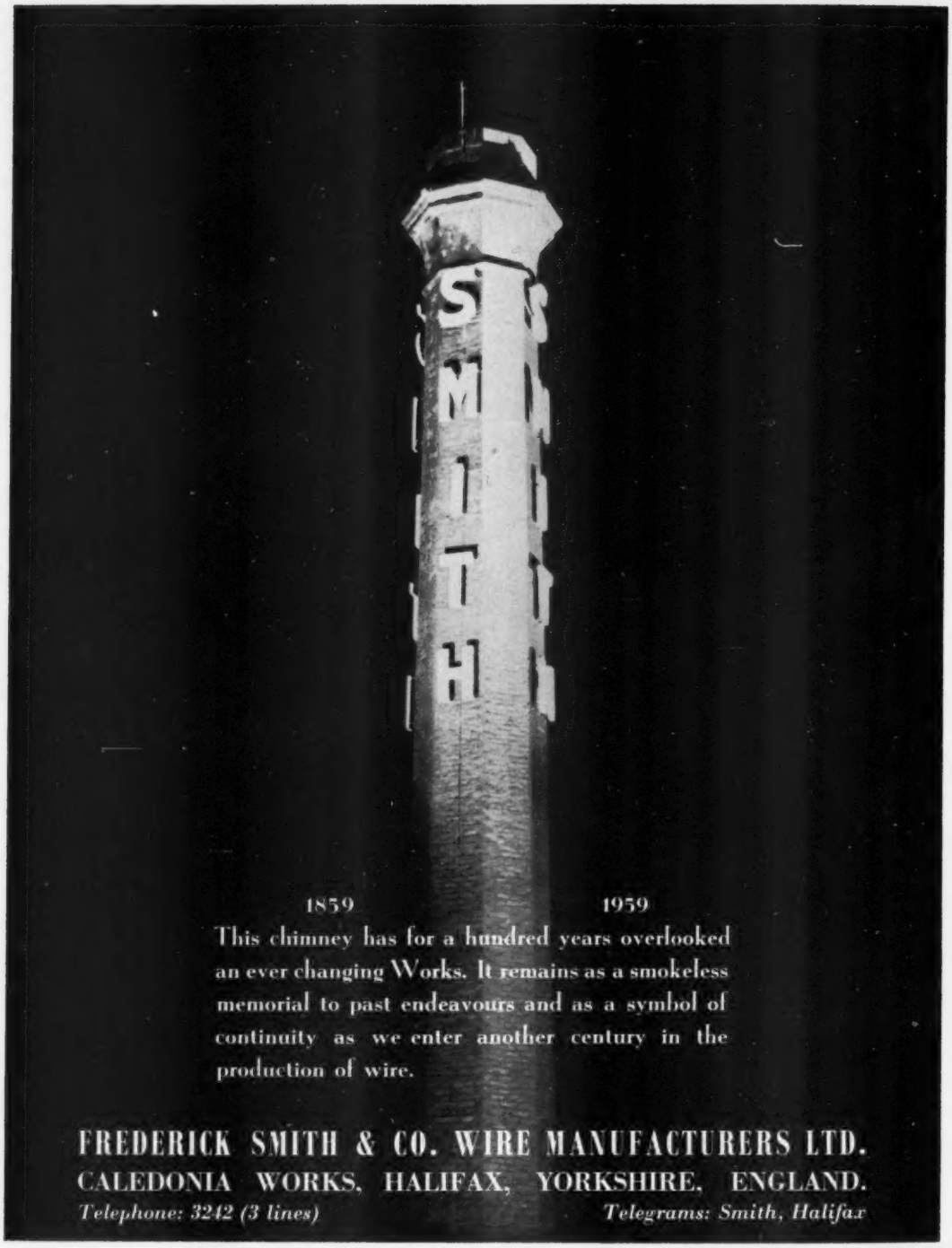
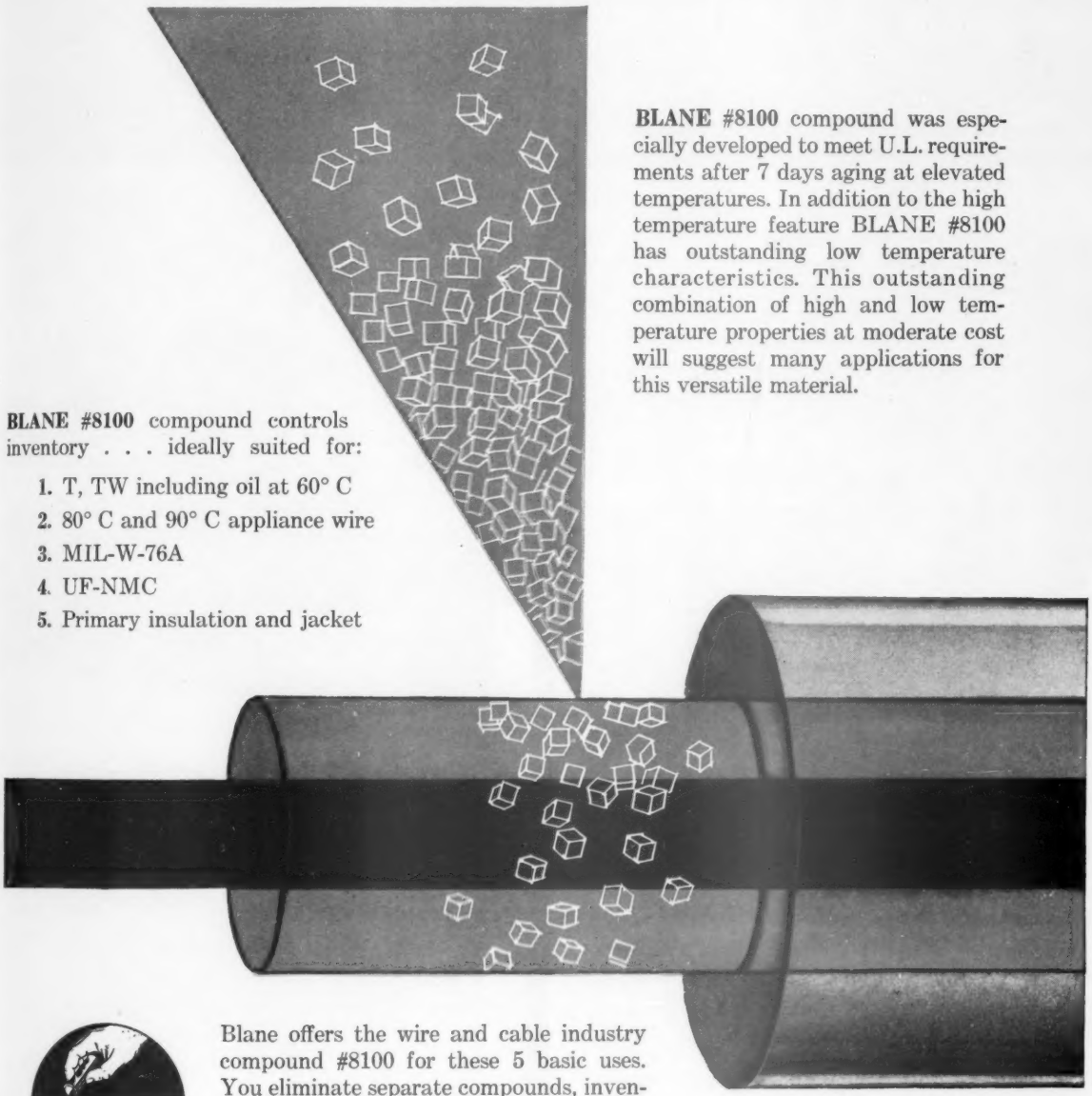



1859 1959

This chimney has for a hundred years overlooked an ever changing Works. It remains as a smokeless memorial to past endeavours and as a symbol of continuity as we enter another century in the production of wire.

**FREDERICK SMITH & CO. WIRE MANUFACTURERS LTD.**
CALEDONIA WORKS, HALIFAX, YORKSHIRE, ENGLAND.
*Telephone: 3242 (3 lines)* *Telegrams: Smith, Halifax*

# NEW BLANE COMPOUND #8100 GIVES YOU EXCEPTIONAL VERSATILITY



**BLANE #8100** compound was especially developed to meet U.L. requirements after 7 days aging at elevated temperatures. In addition to the high temperature feature BLANE #8100 has outstanding low temperature characteristics. This outstanding combination of high and low temperature properties at moderate cost will suggest many applications for this versatile material.

**BLANE #8100** compound controls inventory . . . ideally suited for:

1. T, TW including oil at 60° C
2. 80° C and 90° C appliance wire
3. MIL-W-76A
4. UF-NMC
5. Primary insulation and jacket

BLANE

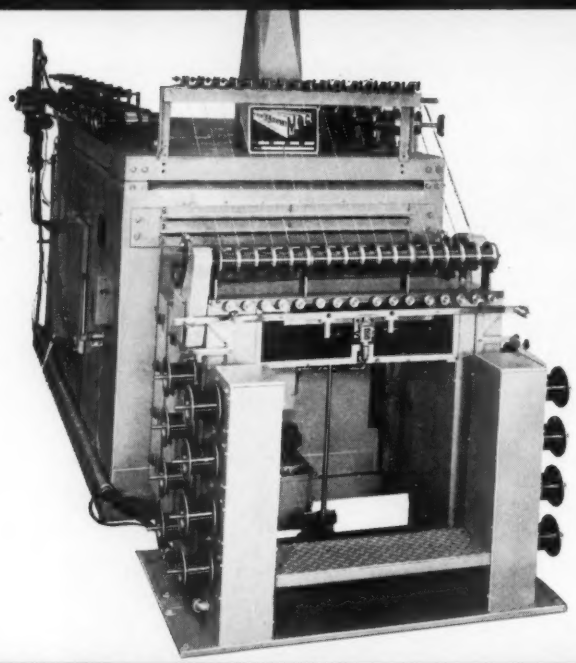
Blane offers the wire and cable industry compound #8100 for these 5 basic uses. You eliminate separate compounds, inventory problems and expensive production delays. This compound has a smooth surface appearance and a superior extrusion rate. Write for samples and technical data, today!

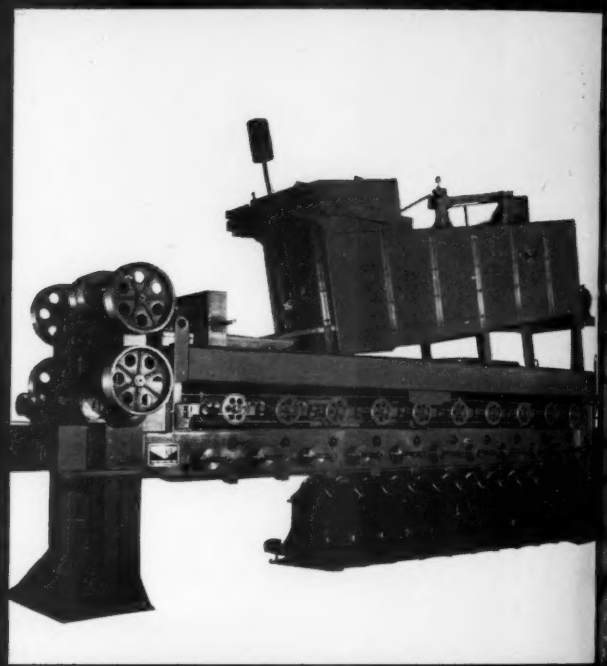
## THE BLANE CORPORATION

38 PEQUIT STREET • CANTON, MASS.

# EXPERIENCE:

## Twelve years of development in gas-fired equipment– Three years of "on-the-job" production results





### WIRE ENAMELING MACHINES

Typical of the complete line is this type "B" machine which handles wire from 31 A.W.G. to 42 A.W.G.

Five other models complete the range from the finest through large rectangles. The horizontal, high volumetric, recirculating double-pass oven allows greatly increased production by rapid heat impartation and a high degree of temperature uniformity throughout the wire chamber. Other features include: a catalyst within the recirculating stream consumes solvents and releases heat energy, individual clutches in each head of the wire capstan, automatic braking device controlling wire tension.

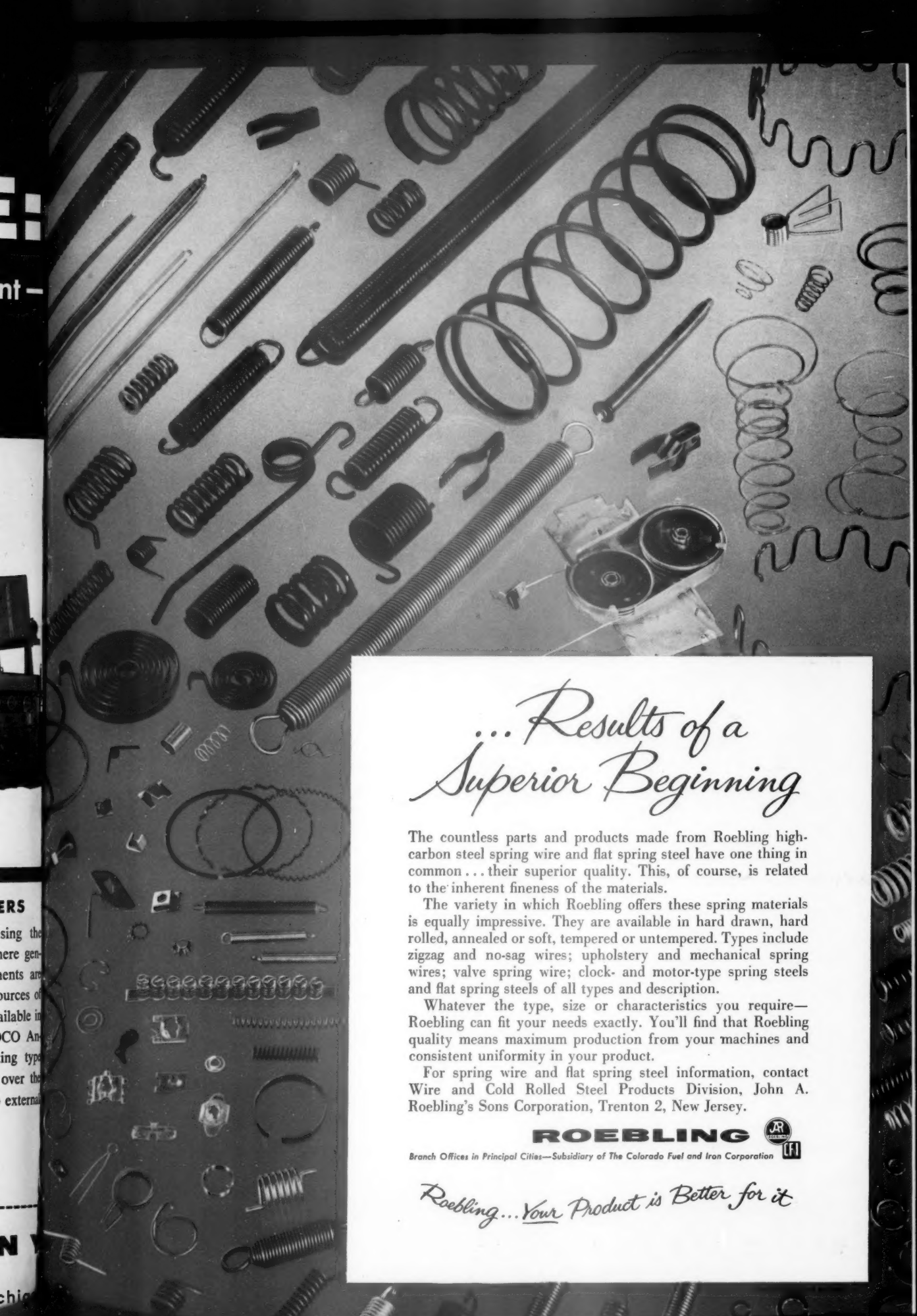
### CONTINUOUS BRIGHT ANNEALERS

This is the first direct gas-fired annealer using the heating equipment as an internal inert atmosphere generator. Advanced mixing and burning equipments are utilized which exclude the need for external sources of steam or costly inert atmospheres. They are available in horizontal or vertical mounting positions. MOCO Annealers are of the high volumetric recirculating type with automatic air-fuel gas ration maintained over the entire range. They have a water sealed exit. No external source of inert atmosphere is needed.

WIRE ENAMELING DIVISION

**MICHIGAN OVEN COMPANY**

425 Brainard • Detroit 1, Michi



# ... Results of a Superior Beginning

The countless parts and products made from Roebling high-carbon steel spring wire and flat spring steel have one thing in common . . . their superior quality. This, of course, is related to the inherent fineness of the materials.

The variety in which Roebling offers these spring materials is equally impressive. They are available in hard drawn, hard rolled, annealed or soft, tempered or untempered. Types include zigzag and no-sag wires; upholstery and mechanical spring wires; valve spring wire; clock- and motor-type spring steels and flat spring steels of all types and description.

Whatever the type, size or characteristics you require—Roebling can fit your needs exactly. You'll find that Roebling quality means maximum production from your machines and consistent uniformity in your product.

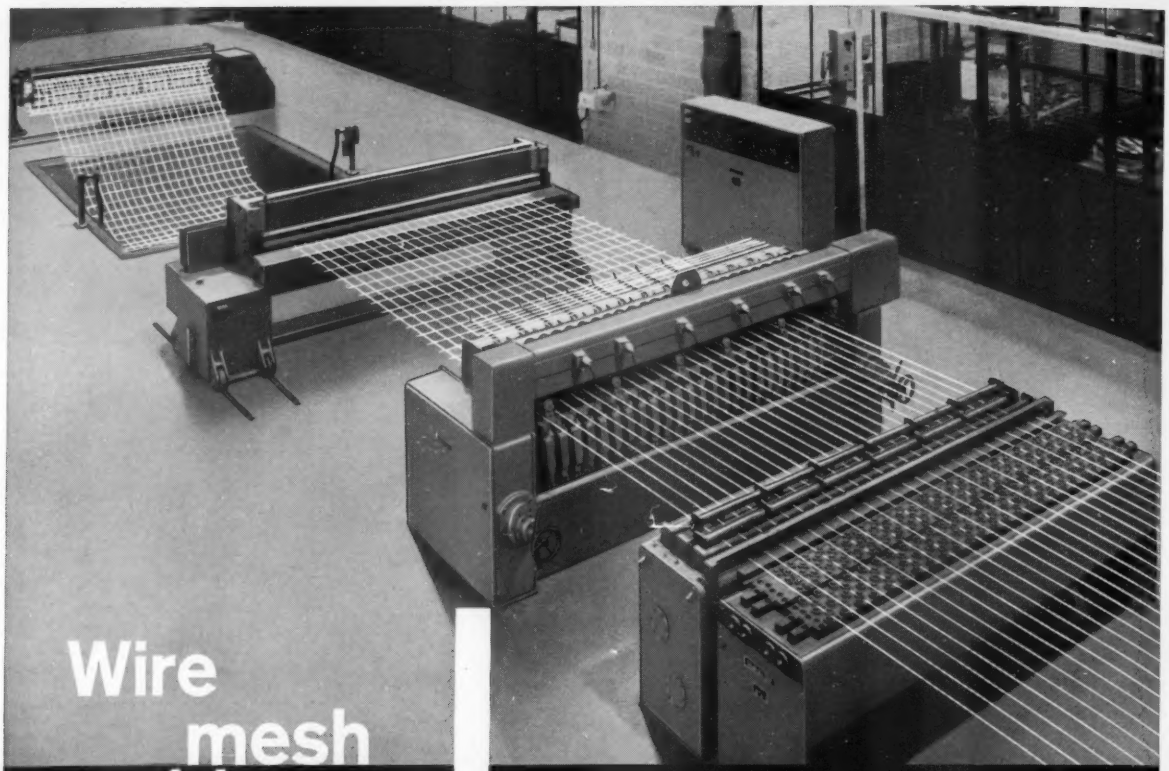
For spring wire and flat spring steel information, contact Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

**ROEBLING**

*Branch Offices in Principal Cities—Subsidiary of The Colorado Fuel and Iron Corporation*

*Roebling... Your Product is Better for it*

"A recent North American Installation"



# Wire mesh welder

for the manufacture of welded fabric sheets and rolls

**Advantages of the welder**

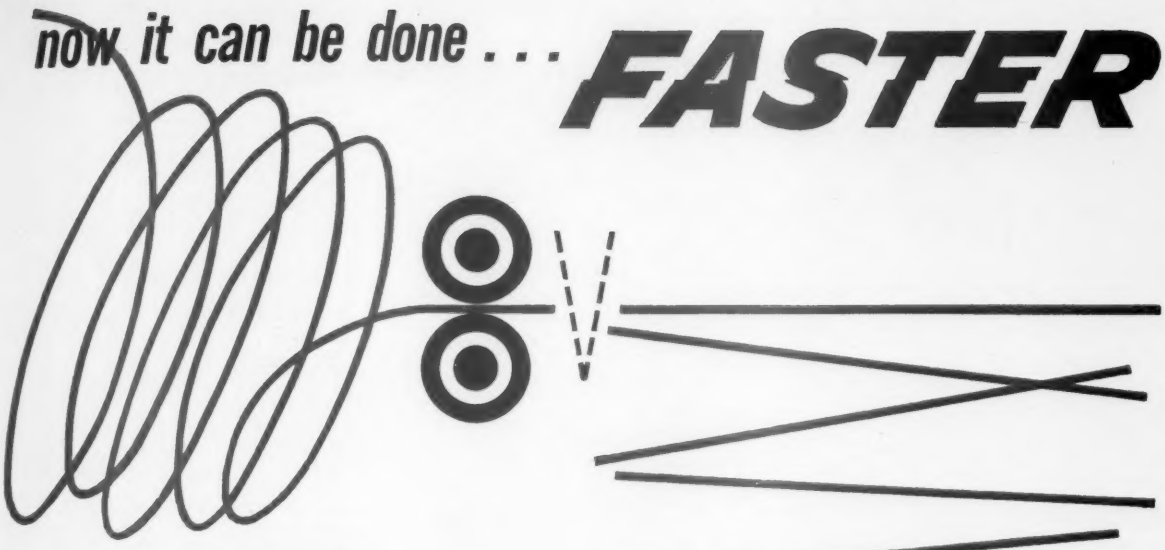
Quick change from one mesh size to another.
Infinitely variable cross and longitudinal wire pitch for any mesh dimension.
Minimum wear of the large-surface electrodes by suitable electrode shape and material, as well as efficient air cooling.
Maximum power factor of the transformers as a result of minimum inductive losses.
Three-phase connection to the mains supply. Electronic current switching by IGNITRON high-power tubes avoiding current surges.
No tearing of the welded mesh and no electrode burning when feeding bent cross wires since the welder stops automatically in such a case.
Effective cushioning of the carriage impact.
Minimum maintenance and servicing thanks to permanent lubrication of all gliding and rotating parts. Automatic oil fog lubrication of all air presses.
Automatic and interlocked sequence of operations and, therefore, always minimum duration of the total welding cycle.
Electrode pressure at every welding spot and feed power are infinitely variable.
Available with attachment for welding three different and preselectable cross wire pitches.

SCHLATTER

Representative for Canada and USA
P. REICHER - Machinery and Equipment
P. O. Box 127, Willowdale, Ontario, Can.

H. A. SCHLATTER LTD. ZOLLIKON/ZURICH
Manufacturers of electric welding machines (Switzerland)

# now it can be done . . . FASTER



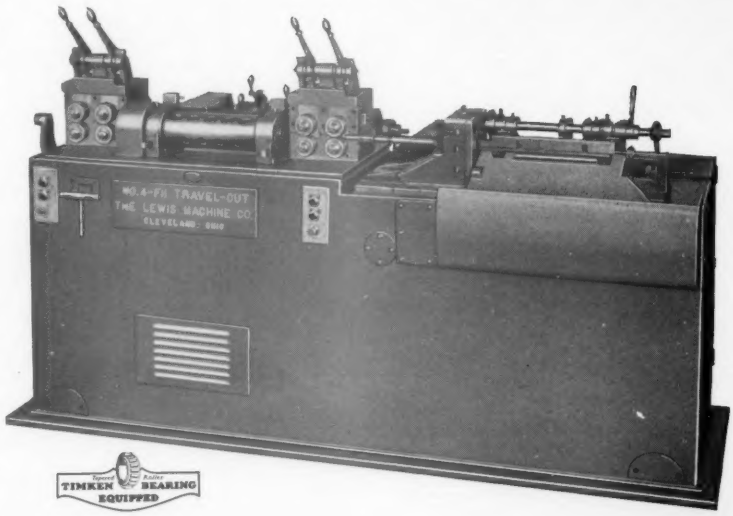
**FASTER FEED . . .**
**FASTER CUTTING . . .**
**MORE ACCURATELY CUT PIECES PER MINUTE WITH . . .**

*Lewis Automatic Flying-Shear Wire Straightening and Cutting Machines.*

Through a new principle of shear operation, Lewis engineers have developed a simplified design which makes possible much higher production with feed speeds from 75 to 520 ft. per minute. A smooth, positive-action, high-speed shear actuating mechanism is attained *without* the use of loose links, cams or springs.

This new cut-off which travels with the rod and cuts while in motion, is ideally suited for either long or short lengths. With an air clutch, perfect synchronization of the cut-off and wire speeds and maximum accuracy is attained in the range of 125 to 395 ft. per minute. Without the clutch, even higher rates of automatic production of welding rod and similar short items are possible.

The Lewis Machine Company also builds machines in a series of models to handle wire from .012" up to and including 1" in diameter.




TIMKEN BEARING EQUIPPED

No. 4FH "Travel-Cut", Automatic Flying Shear Wire Straightening and Cutting Machine designed for the high-speed cutting of commercial welding rod and similar short lengths. Capacity in mild steel, 3/32" to 1/4" ...high carbon, alloy and stainless 3/16" maximum.

THE **LEWIS**

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**Youngstown rope wire**

*will help speed construction in his day*

New schools for a burgeoning population—super highways of greater breadth and width—modern plants that serve whole nations—these are only three of the millions of new construction projects this boy will see completed with the assistance of wire rope fabricated from Youngstown wire. Continuing advancements in research and steelmaking facilities make certain that when the buildings of *his* day rise into the sky ... *Youngstown Rope Wire will help construct them.*

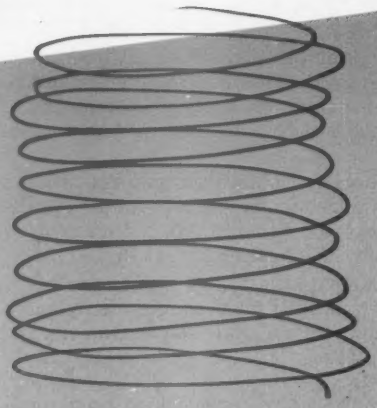
QUALITY YOUNGSTOWN SERVICE

THE
**YOUNGSTOWN**
SHEET AND TUBE COMPANY

*Youngstown, Ohio*

*Manufacturers of Carbon, Alloy and Yoloy Steel*

# Our Experience—Your Advantage!



NON-SLIP MULTIDRAFT WIRE DRAWING MACHINE MODEL G II WITH 6 DRAFTS, SUITABLE FOR LOW- AND HIGH-CARBON STEEL WIRE AS WELL AS NON-FERROUS WIRES.

MASCHINENFABRIK

**HERBORN**

BERKENHOFF & DREBES A.-G. **HERBORN** DILLKREIS, GERMANY

# Are You Sure You Are Using the BEST Wire for Your Application?

•Ask yourself this question—then let PAGE work with you to determine the *exact* wire specification best suited to your need. We have helped many manufacturers *add value* to their product *without increasing their cost.*

Here at PAGE we are in an ideal position to work with wire users in developing better wire for specific needs. PAGE is a specialty wire mill. Manufacturing wire has been our sole business since 1902.

Our engineering and production staffs regard wire as an important tool which can be designed and made to fill the exact requirements of our customers. For example: PAGE *Special HB*, with tensile strength approximating that of music wire. This *Special HB* Wire meets many requirements where music wire was previously considered a necessity—at cost savings for our customers up to 60%!

Over the years PAGE has maintained a progressive attitude which has pioneered many "**firsts**" in the wire business. Among this list are items such as—

**The first adoption of the patenting process in the U.S.**
**" " to use Tungsten Carbide Dies**
**" " to produce and promote Stainless Steel Strand**
**" " Woven Wire Fence**
**" " Stainless Steel Fence**
**" " All-Aluminum Fence**
**" " commercial producer of Aluminized Wire**

Above all, PAGE is a dependable wire source. Many of our customers have grown with PAGE for nearly half a century. PAGE experience, talents and facilities are available to you at all times. We will be glad to work with your people in analyzing your wire needs, and if found advisable, in developing a new wire specification which may add to the usefulness and value of your own product.

## PAGE -a Dependable Source for MANUFACTURERS' WIRE

Partial list of PAGE Wire materials, sections and special purpose wires:

| MATERIALS | SECTIONS |
|---|---|
| Low Carbon | Rounds |
| High Carbon | Half Rounds |
| Low Alloy | Ovals... Flats |
| Stainless Steel | Half Ovals |
| Armco Ingot Iron | Squares |
| Aluminized | Special Shapes |

**SPECIAL PURPOSE WIRES**

| | |
|---|---|
| Aircraft | Signal Corps |
| Antenna | Spiral Binding |
| Armature Banding | Spring, Mechanical |
| Belt Hook | Spring, Upholstery |
| Broom | Stapling |
| Buckle | Stitching, Automotive |
| Button Fastening | Strand |
| Clip | Telephone |
| Core (ACSR) | Telegraph |
| Hairpin | Thermocouple |
| Lashing | Tire Bead |
| Lock Washer | Weaving |
| Safety, Lock | Welding |
| Shaped | —and others |

## PAGE -a Dependable Source for SHAPED WIRE

**Many Grades** • We furnish Shaped Wire in Low or High Carbon, Aluminized, Low Alloy or Stainless Steel, and in Armco Ingot Iron.

**Many Sizes** • Cross-section areas to and including .0625 sq. in. Flats and rectangles to 3/8" (width-thickness ratios to 6:1). Also rounds, half rounds, ovals, half ovals, squares, and specials.

**Packaged Right** • PAGE Shaped Wire—in standard or special coils or in random, exact or multiple lengths, is packaged as you want it: bare bundles, waterproof paper-wrapped, burlapped, boxes, cartons, Leverpaks—palletized on request.

***(SPECIAL NOTE** • We do not stock finished shapes We manufacture to customer specification)*

## PAGE -a Dependable Source for WELDING WIRE

**33 different analyses** for: heavy automatic or light manual submerged arc; inert gas manual; automatic, tungsten or metal arc; oxy-acetylene gas welding.

**Wide Analysis Range**...*Any carbon* from Armco (.025 max.) to high carbon (.70-.84); all the most popular welding grades of *low alloys;* all standard AISI grades of *stainless.* Other types on request.

**Gas Rods**...Medium or high carbon steel, mild steel, Armco, low alloy, stainless steel, manganese or naval bronze.

**Bare Electrodes**...Any carbon from Armco to high carbon (.70-.84).

**Metal Spray Wire**...Any carbon from Armco to .80 carbon, low alloy, stainless steel, manganese or naval bronze.

**BOOKLETS AVAILABLE NOW!**

*Write us at Monessen, Pa., for informative literature on*

☐ Shaped Wire ☐ Welding Wire ☐ Aluminized Wire
☐ Strand ☐ Gas Welding Wire

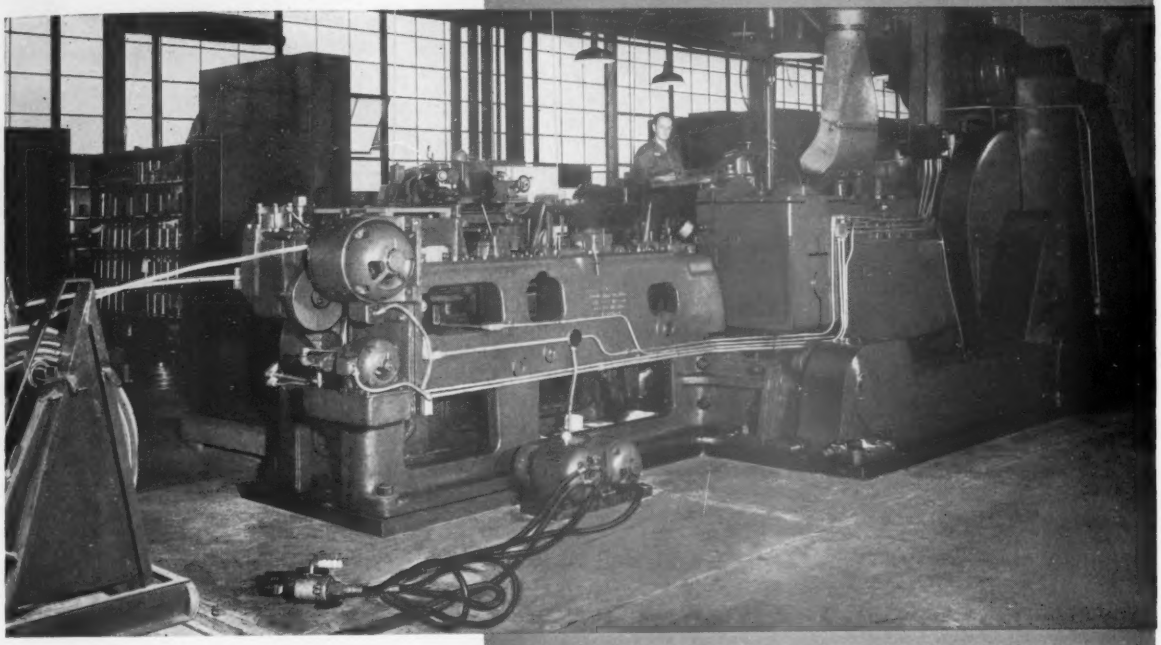
**Page Steel and Wire Division**
**AMERICAN CHAIN & CABLE**

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

# Ajax-Hogue Wire Drawers

## Built in Eight Sizes *for* All Cold Headers



*Courtesy of Lake Erie Screw Corp., Cleveland, Ohio*

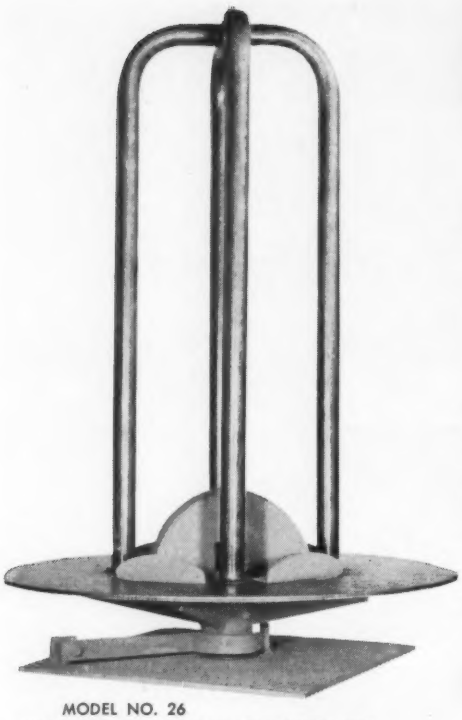
AJAX-HOGUE WIRE DRAWERS Can be attached to any make Cold Heading Machine with which we are familiar.

It is a complete Wire Drawing unit driven from the header by roller chain. Built in eight sizes, it can handle all diameters of rod from the smallest available, namely No. 5 size rod up to a maximum of 1½" diameter.

**LOWER MATERIAL COSTS**
**IMPROVED PRODUCTS**
**LONGER DIE LIFE**
**CLOSER WIRE TOLERANCES**
**STRAIGHT WIRE BLANKS**

• *Write for Bulletin No. 111-A* •

THE **Ajax** MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST., CHICAGO 3, ILLINOIS
W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



MODEL NO. 26
WIRE CARRIER MOUNTED ON PAY-OFF REEL

WORKING WONDERS WITH WIRE:

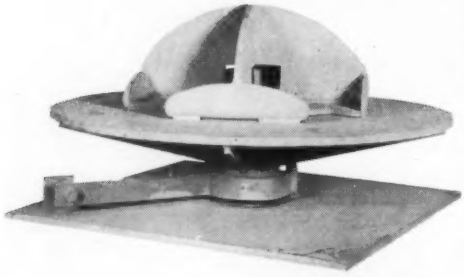
# How to reduce changeovers, handling, down-time, scrap-ends 4 to 10 times!

**Leading wire producers and fabricators across the country use (and recommend)**

## NORTHERN INDIANA STEEL'S

**HIGH CAPACITY, HEAVY DUTY**

# WIRE CARRIERS and PAY-OFF REELS



MODEL NO. 26
PAY-OFF REEL

Let us know exactly what your operating needs are. If we don't already have the wire carriers and pay-off reels in stock, we're ready to make up your order as per your exact specification. In any case, we'll be pleased to quote you promptly in the quantities you specify.

**They feed more smoothly**

**Handle 2000# to 4000# coils**

**Stack and store easily**

**And—They're Designed and Produced To *Your* Specifications**

## Northern Indiana Steel Supply Co., Inc.

Fabricating Division, Michigan City, Indiana
TELEPHONE TRiangle 4-3241

# COMING — THE SPRING REGIONAL MEETING

## of

# THE ELECTRIC WIRE & CABLE SECTION

## THE WIRE ASSOCIATION

***A Good Meeting for all Men Concerned with Production***

**THE TIME: April 29-30, 1959 THE PLACE: Statler Hotel, Boston, Mass.**

### THE PROGRAM

**Wednesday Morning, April 29**

**9:00 A.M.—Registration—Members, Guests, and Ladies.**
**10:00 A.M.—Electric Wire & Cable Section Committee Meeting.**
**10-11 A.M.—Ladies' "Get Acquainted" Coffee Break.**
**12:15 P.M.—Committee Luncheon for Program Participants.**

**Wednesday Afternoon and Evening, April 29 — *Program of Activities:***

**1:00 P.M.—Ladies Tour of Historical Boston.**
**1:45 P.M.—Address of Welcome by Allan B. Dove, Association President.**
**2:00 P.M.—Technical Session.**

MODERATOR: JAMES E. FLOOD, Technical Director, Plastic Wire & Cable Corp., Jewett City, Conn.

PAPERS: "Induction Heating System for Thermoplastic Extrusion" by GEORGE E. CARLE, Div. Eng.-Extruding, and Peter Hold, Res. & Devel. Eng., Farrel-Birmingham Co., Ansonia, Conn.

"Wire Handling Systems" by PHILIP C. GREENE, Sales Manager, Davis-Standard Div., Franklin Research Corp., Mystic, Conn.

"Common Extrusion Problems and Their Solution" by JOHN L. YOUNG, Technical Service, Plastics Div., Monsanto Chemical Co., Springfield, Mass.

"Processing of Cross-Linked Polyethylene" by ARTHUR C. ROWLEY, Sales Representative, R. T. Vanderbilt Co., New York, N. Y.

**6:00 P.M.—Hospitality Hour preceding dinner as guests of several concerns.**
**7:00 P.M.—Dinner, followed by after-dinner speaker of national reputation. Ladies are invited to the Hospitality Hour and Dinner.**

**Thursday Morning and Afternoon, April 30 — *Program of Activities:***

**9:00 A.M.—Technical Session.**

MODERATOR: THOMAS K. COX, Eng.—Rubber & Plastic Covered Wire, Western Electric Co., Baltimore, Md.

PAPERS: "Controlled Cooling of Extruded Polyethylene Insulations" by MICHAEL M. SUBA, Manager, Extrusion Materials, Union Carbide Plastics Co., New York, N. Y.

"Continuous Annealing, Preheating and Insulating of Electrical Conductors" by BROOK W. LERCH, Engineer—Rubber & Plastic Insulating, Western Electric Co., Baltimore, Md.

"Quality Control in Processing of Submarine Cable" by W. M. FLEMING, JR., Quality Control Supt., Submarine Cable Div., Simplex Wire & Cable Co., Newington, N. H.

"Electric Wire Quality Control" by WILLIAM M. LAND, Chief Chemical Engineer, Surprenant Manufacturing Co., Clinton, Mass.—A discussion plus a motion picture.

**1:00 P.M.—Visit to SIMPLEX WIRE & CABLE COMPANY's plant in Cambridge, Mass.**

Be sure to attend this important meeting. Association members will receive hotel reservation cards by mail. Others desiring to attend may write for them. All electric wire and cable men are cordially invited.

## THE WIRE ASSOCIATION

**RICHARD E. BROWN, *Executive Secretary***

**453 MAIN STREET** • **STAMFORD, CONN.**

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# MORGAN CONNOR

## Low Power Cost ow D

## WIRM

These are the benefits you want most from ow Spa wire machine:

### Low Power Cost

Less power is required to operate one motor tha ensively several smaller ones. Morgan-Connors operate o the succ a single motor of the right capacity to make th most efficient use of power.

### Low Die Cost

Morgan-Connor air cooling inside and outside th , continu coil effectively preserves the wire coating and mai tains lubrication—thereby increasing the life o us tell y the dies. nnor Wi

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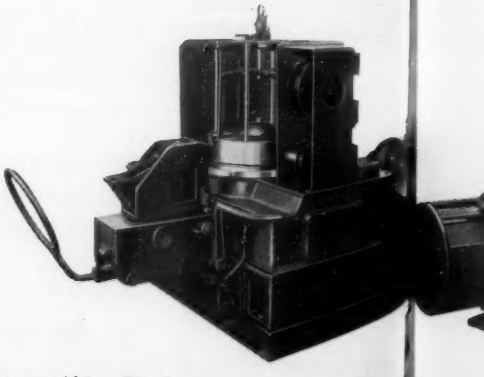
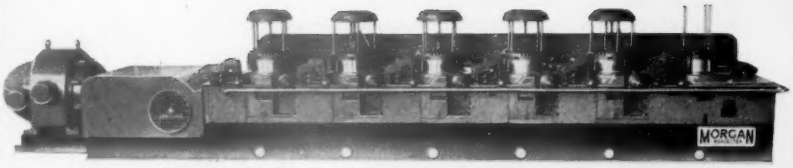


*Morgan Wire Block*

rgan Ho

ost w Die Cost · Low Space Requirement · High Production

# GAN




*Type BW—Morgan-Connor Wire Machine*

# MACHINES

*Type B—Morgan-Connor Wire Machine*

from ow Space Requirement

ompactness coupled with convenient and safe op-
ation are major objectives of Morgan-Connor
ngineers. The fact that Morgan-Connors are used
or tha tensively by the world's largest producers is proof
rate o the success of our designs.
ake th

igh Production

and basic design, sturdy construction, no-slip op-
ation, flexibility in drafting and air cooling permit
side tha , continuous drawing.
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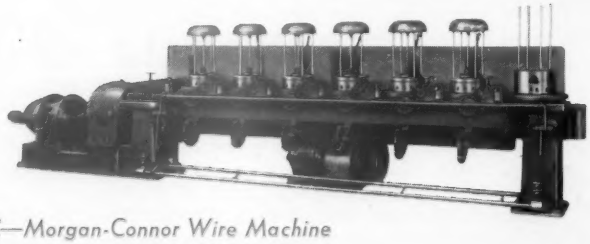
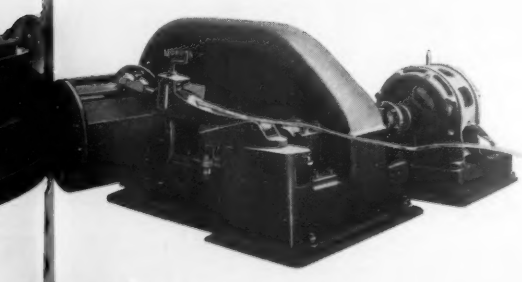
t us tell you more of the benefits of using Morgan-
nnor Wire Machines.

**ORGAN CONSTRUCTION CO.**
**WORCESTER, MASSACHUSETTS**

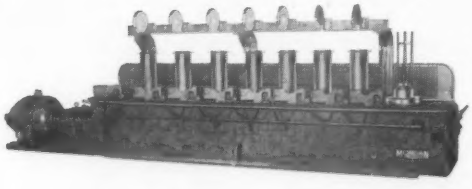
WM-70



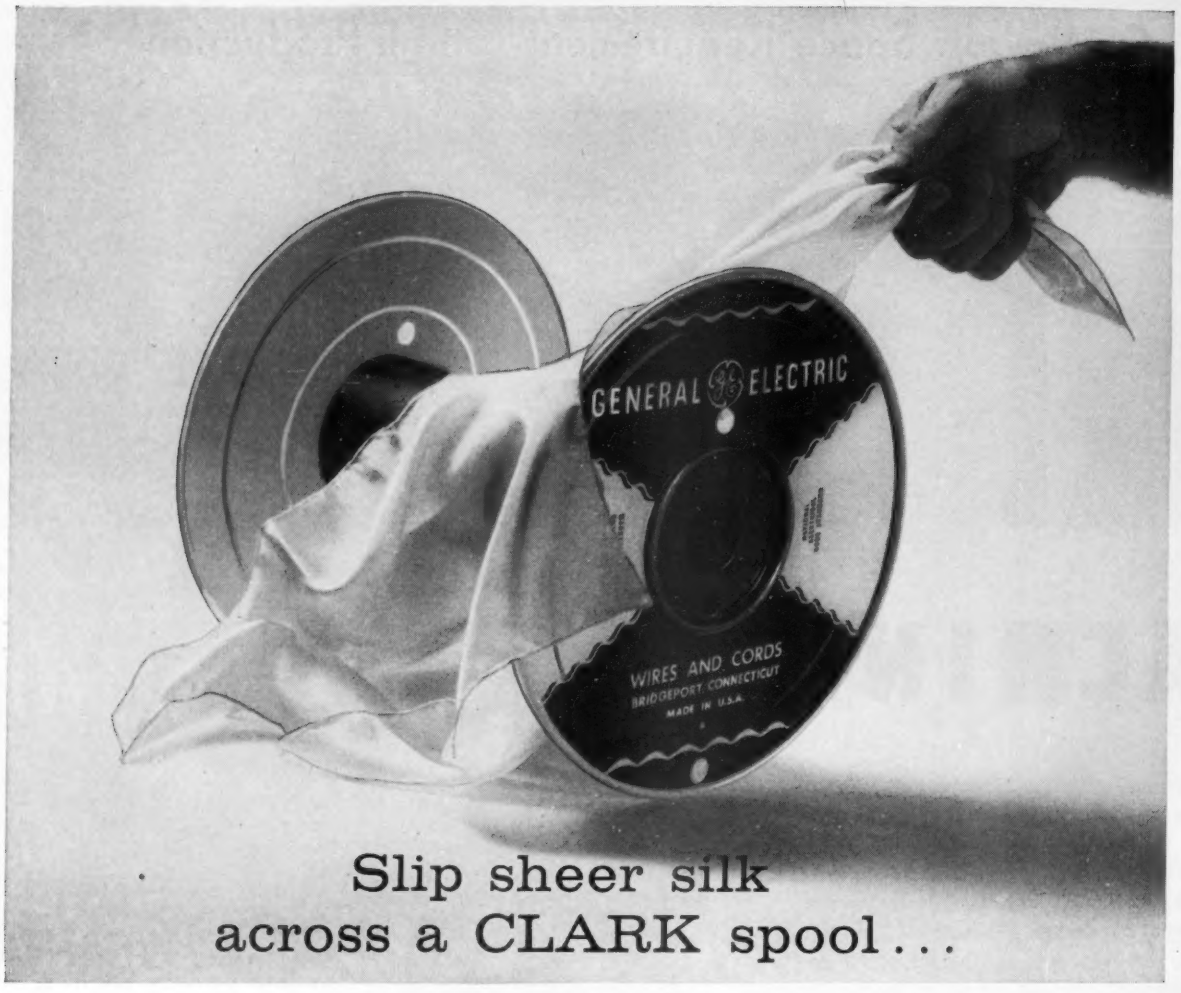
*Type C—Morgan-Connor Wire Machine*



*organ Horizontal Bull Block*



*Type F—Morgan-Connor Wire Machine*

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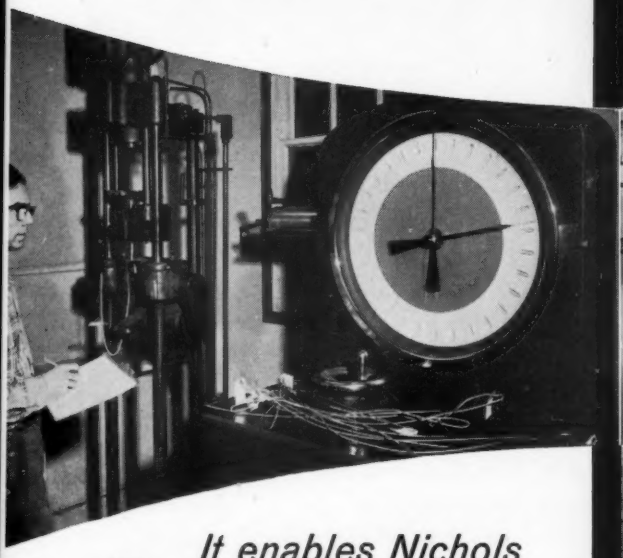

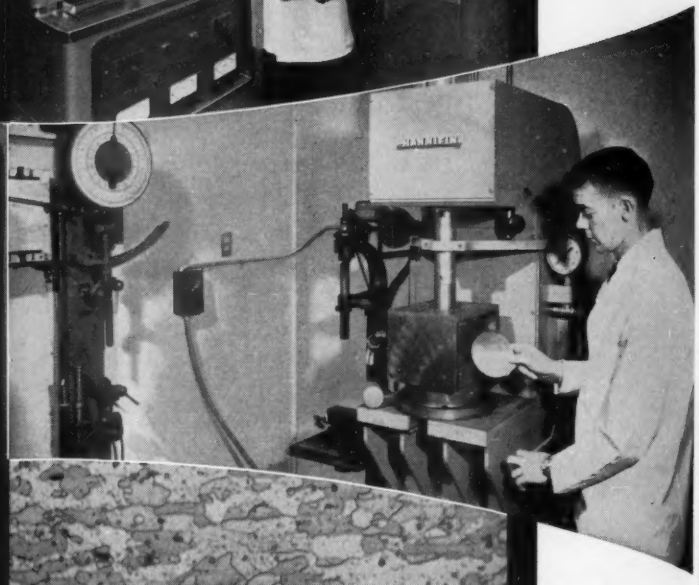

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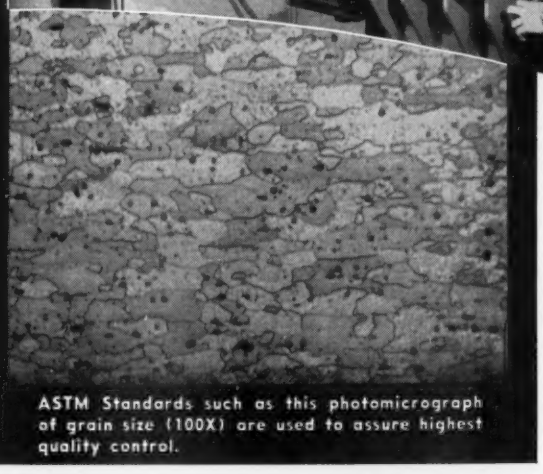

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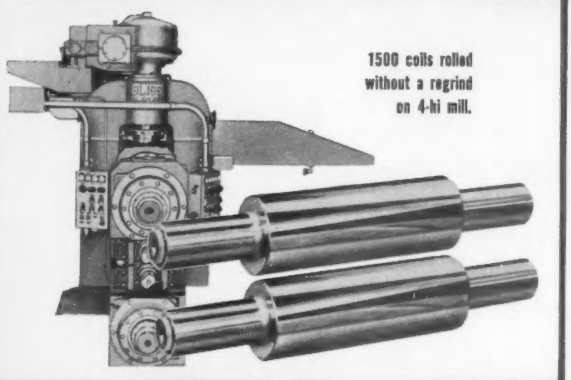
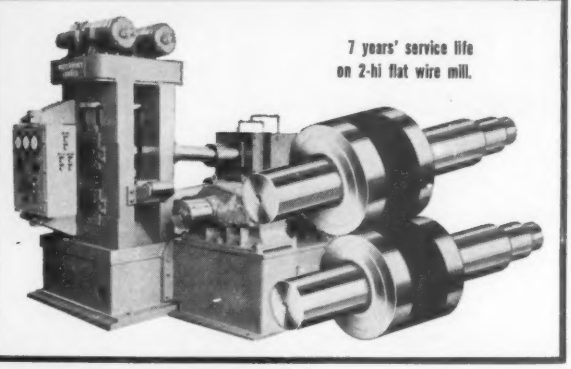


1500 coils rolled without a regrind on 4-hi mill.



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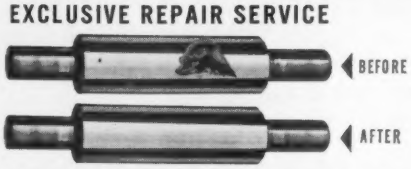


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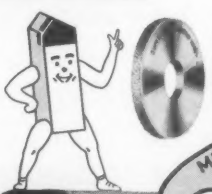

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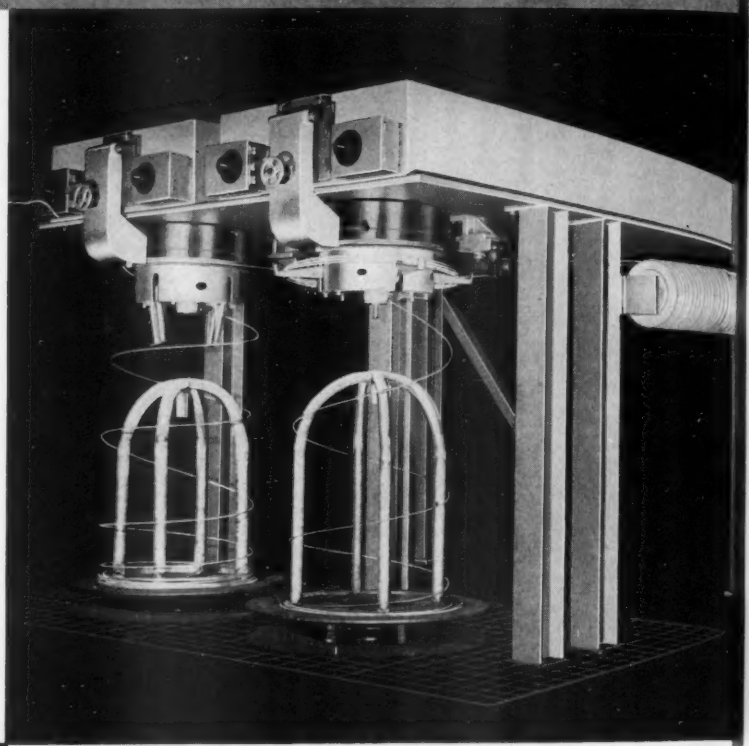

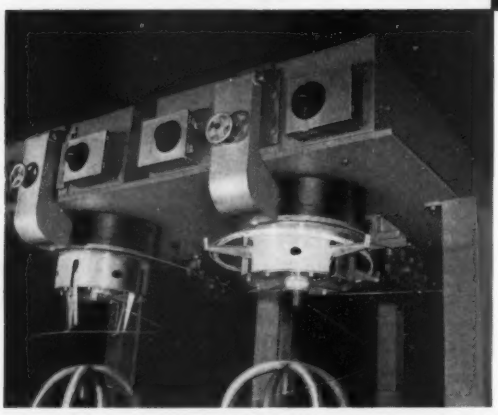

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# The Wire Outlook

Possibly the best indication of the extent to which recovery from the recession has progressed is in steel production. By the middle of March this stood at 91.8 percent of capacity. Steelmaking by January 1, 1959, due to expansion in 1958, was rated at 147.6 million tons. The previous all-time annual production high was in 1955, when 117 million tons were poured. The highest monthly production was recorded in October, 1956, which was 400,000 tons less than the current March output of 11.5 million tons. This is at an annual rate of 138 million tons.

While 1959 is expected to be a good year, the prophets of things to come say that 1960 will be a better one on all business fronts—substantially better than this year.

If the Federal Reserve's measures are effective—the tightening of credit and higher interest rates—there will be no inflation, but we have to bear in mind that deficit spending has to be accounted for some day and there is a strong trend toward higher taxes of all kinds on the part of state and local governments. Every penny removed from the taxpayers' pockets will reduce the ability of the public to buy manufactured products. There appears never to be any thought of reducing expenditures for boondoggling projects of marginal and doubtful value.

In the first quarter, plans for home improvements increased and new dwelling spending reached an all-time high—about 30 percent over the same period last year. Industrial production now stands at about 98 percent of the pre-recession period. Durable goods production, except for the glass strike that slowed down the Chrysler plants, was generally up. Non-durables are 4 percent higher than the pre-recession peak. Public construction is running 16% higher than last year, mostly accounted for by the road building programs. Inventories have taken another spurt of $300 millions.

The gross national product (GNP) is pushing to new highs. It set a record in the last quarter of 1958 (at an annual rate of $453 billions), which brought the total for the year to nearly $438 billions. Present indications are that this year will wind up with a GNP of around $465 billions. 6 percent of this will reflect price increases and 4 percent an expansion of real output.

As total farm income reached a new high in 1958, with a gross income of 38 billion dollars and a net increase of $13.1 billions (up $2.3 billion), the farmers are better off than at any time in the last five years, which looks promising for merchant wire products.

Unemployment is a major problem. With higher wages and production that has not kept pace with them, industrial concerns have had to turn to a greater degree of automation in an effort to get along with less labor.

A second quarter survey made by Dun and Bradstreet indicates that a growing percentage of business executives anticipate larger sales this year—77 percent. This survey covered 1,542 manufacturers, wholesalers and retailers. 20 percent foresaw no change and 3 percent thought sales would be smaller.

Merchant wire products are beginning to show signs of life. Manufacturers' wire sales are expected to be some 40 percent better than last year and are comparatively strong. March bookings were about 15% ahead of February. Some of the wire buying noted is for inventory, which reverses a long trend in the other direction. Imported rods, wire and merchant products is keeping the wire industry from paralleling the growth of other branches of industry.

A prosperous economy, says our President, depends upon the American people and not on Federal spending. This is a truism that our legislators—national and local—should have drilled into their thinking. Who will do it, if their constituents don't!

Edmund Duval Sickels
EDITOR

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Vol. 34 APRIL, 1959 No. 4

# Drive Systems for High Speed Tandem Wire Flattening Mills

by

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and

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Schenectady, New York

**In this article the authors have stressed the increasing emphasis on automation in view of the growing need for better and more flat wire.**

## Introduction

**Within** the past few years there have been impressive strides in the development of high speed tandem wire flattening mills. The science of electrifying these mills has been, by necessity, a parallel development.

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**It** is the purpose of this article to describe a modern wire flattening mill system with particular emphasis on the electric drive.

## Early Machines

**Prior** to World War II the wire flattening mill consisted of one or two, and occasionally a third mill stand, all driven by a common motor. The motor was connected to the mill stands through various gearing arrangements which limited both top speed and interstand speed relationships. If an edger stand was included it was usually not driven. A typical mill representing this period is shown in figure 1.

**The** finishing speeds of these machines seldom exceeded 400 fpm. Because the drive was usually a single motor operated from a constant potential bus, the system was inflexible and it was usually necessary to make multiple passes through the mill to produce the desired product from a single entering wire size. The undesirable alternative was a complete inventory of various wire sizes.

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**The** reeling equipment (take-up and pay-off) was driven by a mechanical connection back to the main drive motor with a mechanical slip device to compensate for reel diameter changes. Reel drives of this type provided relatively crude control of reeling tension. Variations in wire tension of 5 to 1 were not uncommon where significant reel build-ups were encountered.

**Manual** screwdowns, gravity lubrication and cooling were the order of the day and was about the extent of auxiliary equipments.

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**The** early machines then were limited in several respects. Low finishing speeds held down production rates. If numerous finishing sizes were required, considerable down time was necessary for mechanical set up. Finishing tolerances were often difficult to maintain. The reason for this was the inability to conveniently adjust individual stand speeds and the lack of adequate tension controls entering and leaving the mill.

## Present Machines

**Figures** 2 and 3 are photographs of modern high speed tandem wire flattening mill installations. These modern mills incorporate features which present productivity requirements demand in wire flattening mills. Some of these features are high speeds, drafting

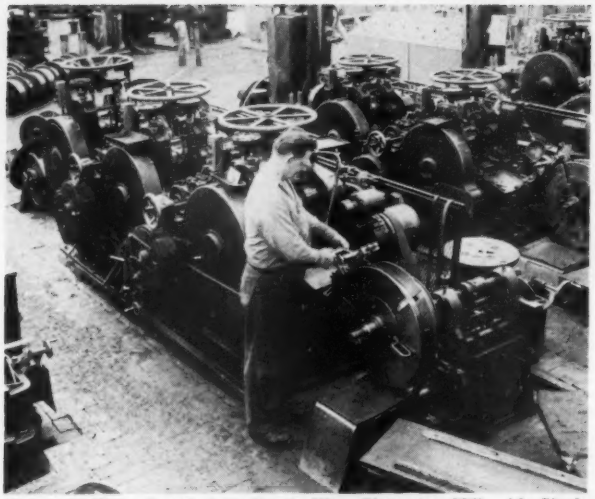

Figure 1—Three Stand, Low Speed, Wire Flattening Mill with Single Constant Speed Drive * * * * * * * * * * *

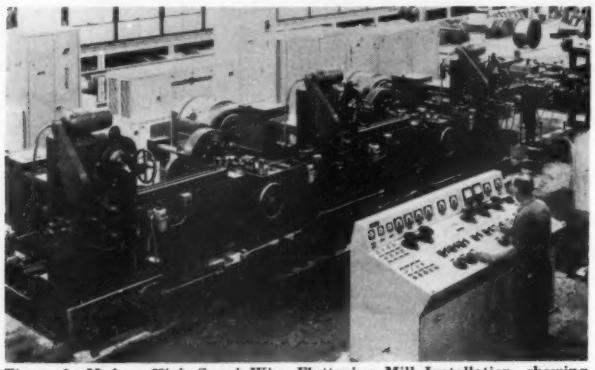

Figure 2—Modern High Speed Wire Flattening Mill Installation, showing Packaged Speed Variator Power Units in the background. * * * *

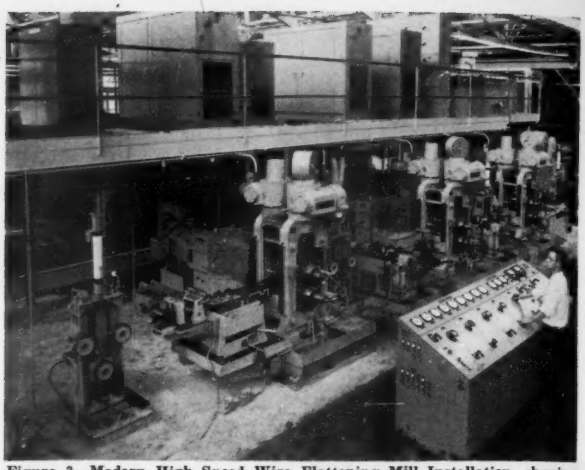

Figure 3—Modern High Speed Wire Flattening Mill Installation, showing Packaged Speed Variator Power Units on the Balcony. * * * *

flexibility, (wide range of drafting schedules), operator convenience and close tolerance on dimensions of the finished product. The major contributions of the electrical drive system in obtaining these objectives will be discussed in detail below. First, let us look at the mechanical arrangement of a modern wire flattening mill installation.

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**Referring** to figure 4, the major mill components are symbolically represented. The wire is processed from left to right in the sketch. Also shown on this sketch are the individual drives for the mill sections, the operator's desk, and the remote operator's devices.

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**The** mills shown in figures 2 and 3 and diagrammatically represented in figure 4, are capable of continuous finishing speeds adjustable from 1000 to 3000 fpm and adjustable thread speeds from 0 to 1000 fpm. Greater drafting flexibility is obtained by three mill stands and two edger stands each with an individual drive motor. The speed of each mill and edger stand is independently adjustable and the interstand speed relationship, once set, will remain essentially constant during acceleration, deceleration, and constant speed operation. The addition of individually driven edgers inherently allows increased area reduction on the edger passes which reduces the necessity of multiple pass scheduling.

★ ★ ★

**Since** the individual stand speeds are easily adjusted, there is less chance of wire slippage. This is very important to any wire producer who is interested in a quality product and minimizing grooving of the rolls which necessitates periodic regrinding. Further, since the tension in the wire is accurately controlled as it enters and leaves the mill, there is no tendency for "necking" which destroys dimensional accuracy.

## Present Drives—General

**Basically** there are two types of drive systems; one for low finishing speeds and one for high finishing speeds. The high speed drive system is usually used on speeds above 1500 fpm. Compensation for voltage drops due to load changes is used in the high speed drive and is the basic difference in the two systems. Thus the low speed system uses a common generator supplying power to all stand and edger motors in parallel, while the high speed system uses booster generators in series with all drive motor to provide the IR drop compensation or individual generators for each of the drive motors with each generator controlled separately to provide IR compensation. Reeling, regardless of type of main drive selected, is best handled by individually controlled generators for both pay-off and take-up reels.

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**For** the purpose of this article, we have arbitrarily chosen the individual generator system for discussion. For the Purchaser, the difference between the two high speed systems is one of economics and minor technical differences. Another Purchaser option is the choice between open or packaged

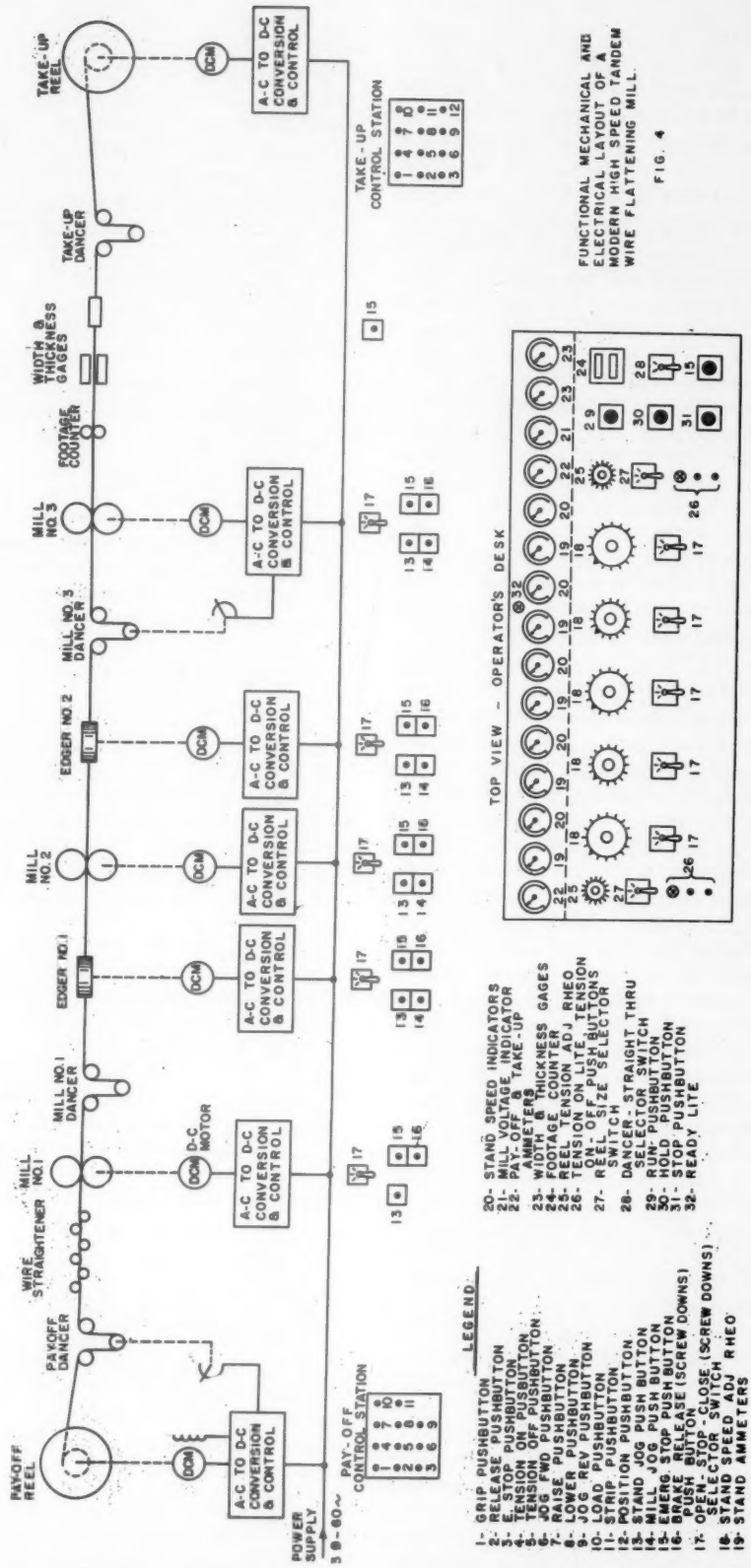
electrical power conversion and control apparatus. Again, since this choice is one of economics and individual installation considerations, we will not dwell on this choice, because it has no bearing on the performance of the equipment.

### Threading the Mill

At this point let us follow the operator as he prepares the mill for running. First he loads the pay-off reel. The functions involved in doing this will be self-explanatory by referring to the legend associated with the pay-off control stand in figure 4. The operator pays off sufficient wire from the pay-off reel by pressing the pay-off jog pushbutton, to thread through the pay-off dancer and wire straightener. He now moves to mill stand #1 and by operating the stand jog pushbutton, he threads mill stand #1, and continues to hold the pushbutton depressed until enough wire is available to thread mill #1 dancer and edger #1. At this point the operator applies stalled tension to the pay-off reel by operating the "tension on" pushbutton at the pay-off reel or at the operator's desk. Edger #1 is now threaded by holding edger stand jog pushbutton until all slack is removed, or until mill #1 dancer is in the middle of its travel. The mill jog pushbutton (at edger #1) is now operated until sufficient wire is available to thread mill #2 (mill jog pushbutton operates the complete mill at thread speed). Successive use of stand jog and mill jog pushbuttons facilitates threading of the wire through the rest of the mill. The screwdowns would have been set at a nominal value sufficient to grip the wire and advance it for threading purposes.

* * *

The operator depresses the mill jog pushbutton at mill #3 until enough wire is available to thread the footage counter, width and thickness gages, and take-up dancer. After loading an empty reel on the take-up reel stand, the operator pushes the "reel position"




FUNCTIONAL MECHANICAL AND ELECTRICAL LAYOUT OF A MODERN HIGH SPEED TANDEM WIRE FLATTENING MILL.

FIG. 4

pushbutton. This automatically traverses the reel until the reel flange lines up with the traverse so that the wire may be attached to the reel at the flange. He then applies stalled tension to the take-up reel.

### Mill Dancer Rolls

A description of the stand drive systems on a modern high speed mill would not be complete without mentioning the dancer rolls which are usually furnished with the mill to increase the flexibility and thus allow the manufacture of small wire at high speeds. The dancer rolls automatically modify stand speed in a vernier capacity to maintain exact stand speed synchronization. Thus, it is to the operator's advantage to utilize dancer control whenever possible. The limitation is a mechanical one dealing with wire size versus dancer sheave size.

### Running the Mill

**With** screwdown settings, individual stand speed settings, and reeling tensions having been roughly adjusted by desk controls in accordance with a precalculated schedule, the operator is now prepared to put the mill into operation. Operation of the run button on the desk starts the mill from rest and accelerates it at a constant rate to operating speed. The operator would probably not allow the mill to accelerate beyond a few hundred feet per minute before operating the "hold" button, which holds attained speed. The reason for holding speed at a low level is to minimize scrap wire until an "on gage" product is obtained. Successive stand speed and screwdown roll position adjustments will be required to obtain desired finishing width and thickness dimensions. Again by depressing the "run" button, the mill will accelerate to operating speed, with no further adjustments required.

★ ★ ★

**The** necessity for stopping the mill would arise in one of three ways: Empty pay-off reel, full take-up reel, or some malfunction dictating an emergency stop. The first two conditions would be considered normal stops and would be accomplished by pressing the "stop" button. The entire mill would decelerate to rest under timed deceleration with all interstand speed relationships and wire tensions being maintained. The emergency stop function can be actuated manually from several remote locations as well as from the desk or by several safety devices. The emergency stop is accomplished by dynamic braking on all mill and edger stands and mechanical braking on the reels. Under emergency conditions, the objective is to stop the mill as soon as possible and no attempt is made to maintain relative motor speeds or wire tensions.

★ ★ ★

**During** normal operation, information on stand load, speed, and slip is available to the operator in the form of indicating instruments on the operator's desk.

## Mill and Edger Stand Drive Systems

**Each** of the mill and edger stands is driven by a cumulatively compound d-c motor with a speed range by motor shunt field control of approximately 3-to-1. Each stand generator voltage is regulated to a common master reference.

★ ★ ★

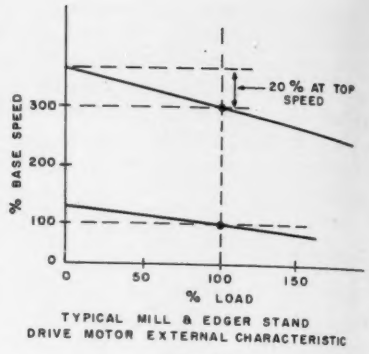
**The** mill and edger stand motors are geared-in so that at motor base speed each successive stand will provide a slightly higher wire speed. This corresponds to the minimum anticipated draft (area reduction). The 3-to-1 speed range by motor field control is provided to allow for drafting schedules in excess of geared draft.

★ ★ ★

A typical motor characteristic curve is shown in figure 5. The curve shown represents a motor with sufficient cumulative series field to obtain approximately 20 percent regulation at top speed (weak field condition). At any reduced speed down to and including base speed (rated shunt field), the percent regulation will decrease.

★ ★ ★

At this point the reader logically could ask why a compound



TYPICAL MILL & EDGER STAND DRIVE MOTOR EXTERNAL CHARACTERISTIC

FIG. 5

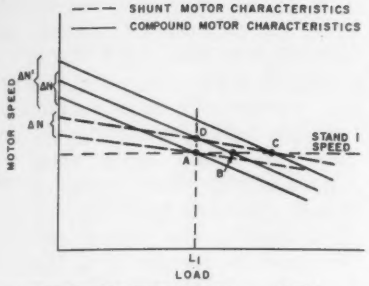
motor is favored over a shunt wound motor (shunt wound motor has no series field). The reason is based on a desire to reduce operator speed control sensitivity and to provide partial automatic stand speed synchronization. The above statement can be clarified by referring to figure 6 where shunt wound and compound wound motor characteristics are compared for two adjacent stands. Assume in each case that stand #1 is adjusted for the proper speed and stand #2 is misadjusted by a value $\triangle$ N above desired speed. Assume further that the load on each stand is the same percentage-wise and represented by $L_1$. Under these conditions stand #2 will want to run at point D and stand #1 at point A. Since this cannot occur without slip, enough tension must be developed in the wire to pull the motors into synchronism. This synchronizing tension is represented by the difference in load between points A and B. Actually stand #1 would speed up and stand #2 would slow down until they were in synchronism, but the wire tension would remain as shown (B-A).

★ ★ ★

**If** shunt motors were used with the same value of stand #2 speed misadjustment, figure 6 shows synchronizing tension in the wire represented by line C-A. This considerably increased value of tension may result in undesirable wire elongation or slipping. This may destroy the dimensional quality of wire or cause grooving of the rolls.

★ ★ ★

**Operator** sensitivity of stand speed control adjustment is another justification for the use of



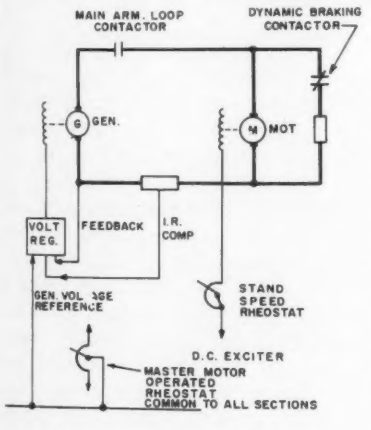

FOR STAND SPEED MISADJUSTMENT ΔN, COMPOUND MOTOR PRODUCES INTERSTAND TENSION A-B, WHILE SHUNT MOTOR PRODUCES INTERSTAND TENSION A-C

FIG. 6

compound wound motors. This is explained by again referring to figure 6. If △ N represents the same rotational travel of the stand speed rheostat regardless of whether shunt or compound wound motors are used, a misadjustment of △ $N^1$ would be required in the case of the compound wound motor before a synchronizing tension equal to C-A would be produced. Thus a less accurate preset adjustment of speed can be set by the operator and still obtain successful operation.

★ ★ ★

A functional one-line diagram for the control of a typical mill or edger stand drive is shown in figure 7. A pilot generator, which is used only on the first and last mill stands to provide a wire speed signal to the reels, is not shown.




FUNCTIONAL CONTROL OF MILL OR EDGER STAND

FIG. 7

The master motor operated rheostat which provides the master reference voltage signal to all mill and edger stand drive systems is shown in figure 7. It is apparent that the control is basically a generator voltage regulator with armature loop IR drop compensation. Thus all stand generator voltages are regulated to a common master reference. This type of control provides for tracking of all stands during acceleration, deceleration, and continuous running.

★ ★ ★

To expand the preceding further, this type of regulator is based on the fact that motor CEMF (Counter Electromotive Force) is directly proportional to motor rpm. It is the purpose of the described regulator to regulate CEMF and thus motor speed. This can be mathematically represented as follows: CEMF = Gen. Volts. — IR drop. It is seen, therefore, that if load current remains constant it is necessary only to regulate generator voltage to maintain a constant CEMF. If the load changes, however, the IR drop will change and the generator voltage must be modified correspondingly to hold a constant CEMF, and therefore speed.

★ ★ ★

To further realize the importance of the IR compensation, consider the operation of the control without this function during threading and acceleration to running speed. This can be explained by considering only two adjacent stands. Assume the operator presses the "run" button and allows the mill to accelerate to thread speed which may correspond to a generator voltage of 30 volts. If, at this point, mill #1 is full loaded, possibly 20 of the 30 volts is consumed in the armature loop IR drop. This would leave 10 volts for motor CEMF (CEMF = Vc — IR). At the same time, stand #2 may be lightly loaded with only 10 volts IR drop in the armature loop, which would leave 20 volts for motor CEMF. Based on the previous statement that motor CEMF is a direct measure of motor speed, it is apparent that stand #2 would try to operate at twice the speed of stand #1.

★ ★ ★

Observing this situation, the operator could readjust the stand speed settings to bring the two stands in to speed correspondence. He would then re-depress the "run" button and would assume the stands would accelerate together to running speed without further adjustment. However, in the practical case, since it cannot be assumed the two loads will maintain the same balance during acceleration, one or more adjustments of stand speed will be required to reach running speed even though the use of compound wound motors would minimize the detrimental effects.

★ ★ ★

If the stand speed rheostats must be used for load compensation, the flexibility of the mill with reference to drafting ranges is considerably reduced. Therefore it is the practice on all modern high speed tandem wire flattening mill electrical driven systems, to incorporate IR compensation.

★ ★ ★

Since the object of the foregoing was to achieve synchronization between all mill and edger stands for various values of loading, the reader could logically assume that the use of individual stand speed regulators would present the ideal solution. But this is not the case because a good speed regulator would cause extreme inter-stand tension sensitivity and limit the resolution of the stand speed rheostats. The primary disadvantage of speed regulators can be seen by referring back to figure 5 in that this type of regulator would further flatten the speed-load characteristic beyond that of the straight shunt machine. Thus, the synchronizing tension problem would be considerably accentuated, especially during acceleration and deceleration.

## Take-up and Pay-off Reel Drives

The primary purpose of both the pay-off and take-up reel drive systems is to maintain wire tension at a selected value under all normal operating conditions. This includes acceleration, deceleration, and constant speed running with the associated reel diameter changes. To maintain constant tension at a given wire speed, the drive must be designed to produce constant motor horsepower during reel diameter change. This can be shown by the

following equation if mechanical losses are neglected:

(1) $HP = \frac{fpm \times lbs.\ tension}{33{,}000}$

Also, in terms of a d-c shunt wound motor:

(2) $HP = CEMF \times Ia \times Const.$

therefore, ideally the objective is to regulate both CEMF and armature current to constant values during build up.
Further,

(3) $CEMF = K \phi f N$

and

(4) $Ia = \frac{Va - CEMF}{Ra}$

Where:

CEMF = Motor Counter Electromotive Force
Ia = Motor Armature Current
$\phi f$ = Motor Flux
N = Motor RPM
Va = Motor Terminal Voltage
Ra = Resistance of Armature Circuit

★ ★ ★

**Obviously** reel motor speed must vary with diameter changes. From equation (3), motor field flux must be caused to vary inversely with motor speed to maintain constant CEMF. Since Va in Eq. (4) is set as a function of line speed and because CEMF is regulated to a constant, Ia is a constant value. We have satisfied the requirement of equation (2) for constant horsepower by changing motor field flux as a function of reel diameter change, since Ia and CEMF were regulated to constant values.

★ ★ ★

**The** use of a d-c shunt motor for the reel drives has the inherent advantage that the motor capabilities are very closely matched to the reel speed load requirements. This is shown in figure 8. It can be seen that in the field control range the curve is hyperbolic. In other words, reel torque multiplied by reel rpm at any point is a constant. Thus the requirement for constant horsepower is satisfied ($HP = T \times RPM \times K$).

★ ★ ★

**The** build-up rheostat type of reel control used on most modern mills is designed to satisfy the ideal requirements for constant tension reeling as described above. Figure 9 shows in simplified one-line form, the complete-reel regulating system.

### Constant Current Operation

**With** relay D de-energized as shown in figure 9, the reel circuit can be considered as consisting of three basic parts, i.e., a voltage regulator, a current regulator, and the build-up motor operated rheostat as a position regulator. The voltage regulator compares a reference voltage from a pilot generator with the reel generator armature voltage to hold reel generator voltage proportional to any wire speed. The current regulator takes its reference from the tension rheostat mounted on the operator's desk and compares it with a feedback proportional to armature loop current.

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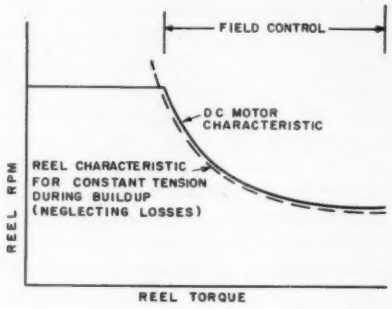
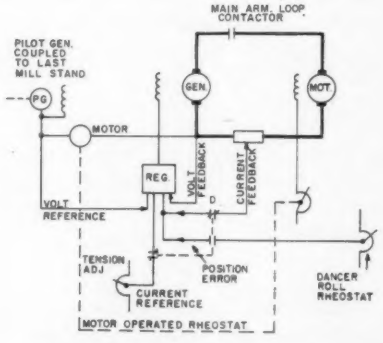
**In** the case of the take-up reel, the reel diameter is increasing with time. Consider an initial condition with both regulators holding their desired levels of current and voltage. A short time later reel diameter has increased a small amount. This forces the motor to slow down slightly, which decreases motor CEMF, thus an increased armature current (see equation 4). In attempting to hold the selected value of current, the current regulator calls for a decrease in generator voltage. When this happens there is a difference between reel generator volts and pilot generator volts which is sensed by the drive motor for the motor operated build-up rheostat. This causes the motor operated rheostat to operate in a direction to restore motor CEMF to its initial value by motor field control, and thus allow reel generator voltage to rise to its initial value.




COMPARISON OF REEL AND D-C MOTOR CHARACTERISTICS
FIG. 8




FUNCTIONAL CONTROL OF PAY-OFF OR TAKE-UP REEL DRIVE
FIG. 9

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**This** recalibrating action of the build-up rheostat continues from empty to full reel. This satisfies the requirements of equation (2) in regulating constant volts (CEMF) and armature current, and therefore constant horsepower.

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**Since** both regulators attempt to achieve their desired values by control of a common element (generator field excitation) this would appear to be an incompatible situation. To obviate this situation, the gain (sensitivity) of the current regulator is designed to be higher than the voltage regulator. This allows the current regulator to override the voltage regulator to produce necessary error voltage for buildup rheostat recalibration.

★ ★ ★

**The** preceding description is based on regulating wire tension by current control (by-passed dancer rolls). When wire size allows the use of dancer roll control, relay D in figure 9 is energized to remove the current reference and feedback signals. In their place a position error signal is used to indicate dancer roll position. Since it is the mechanical function of the dancer to maintain constant wire tension, the electrical control has only the responsibility of keeping the dancer roll within its travel limits. Thus the regulator now controls dancer roll position rather than armature current, but functions with the voltage regulator in the same manner as previously described to allow build-up rheostat recalibration. As was mentioned above, the dancer roll itself

(*Please turn to page* 495)

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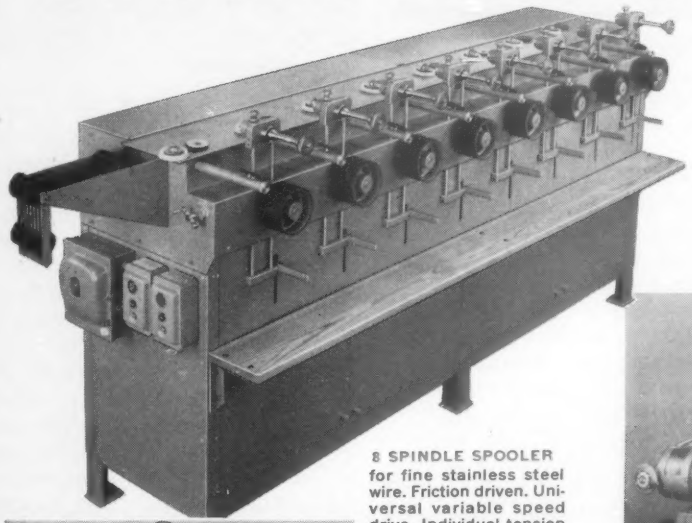


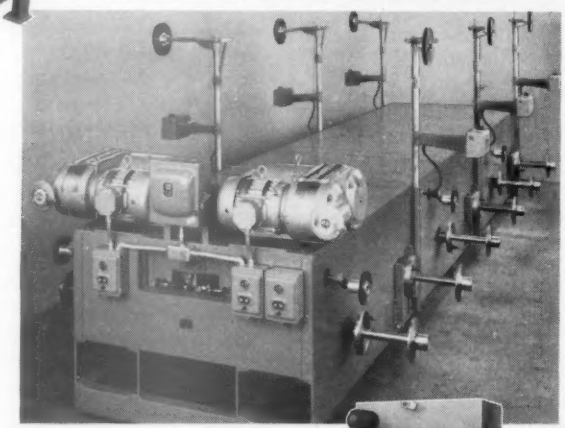
8 SPINDLE SPOOLER for fine stainless steel wire. Friction driven. Universal variable speed drive. Individual tension control for each spindle. Adjustable traverse drive for varying lay of wire. Traverse and spool adjustment at each spindle.

***Operational advantages:***

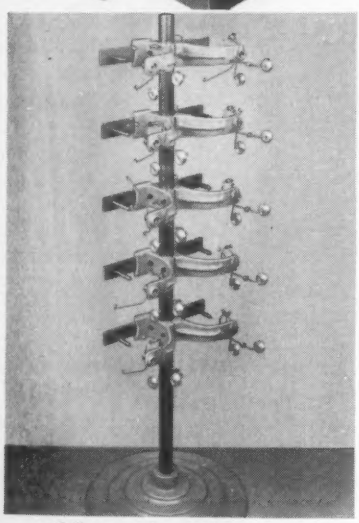
**(1)** Larger packages and finer wire at higher speeds.

**(2)** Improved accuracy for more precision packaging. (Individual traverse adjustment for each spindle to correct spooling.)

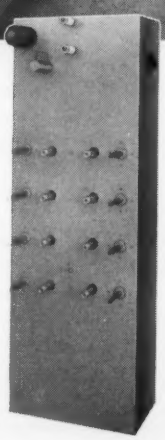
**(3)** Traverse drive easily adjusted so lay of wire can be changed at will to accommodate varying wire diameters. Traversing mechanism electrically controlled and driven by separate geared head motor.



6 HEAD RESPOOLING MACHINE. Three heads on each side of machine. Handles reels ranging from 12" to 24" head diameter and traverse up to 12".



10 HEAD SPINNER-TYPE LET-OFF. Automatic brake tension control. Ceramic guides. Spool is stationary, does not rotate. Machine requires small floor space area.



8 SPINDLE FINE WIRE SPOOL TAKE-UP MACHINE. Variable speed capstan drive. Individual torque motor drive for each spindle. Individual powerstat trimmers for varying spindle torque. Adjustable traverse drive for varying lay of wire.

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# Teflon 100X FEP Wire and Cable Insulation: Its Place in the Fluorocarbon Family

by William M. Land
Chief Chemical Engineer
Surprenant Mfg. Co.
Clinton, Massachusetts

**This article is a study of the comparative electrical insulation performance of three fluorocarbons that will supply answers to the questions most frequently asked about them. While papers on one or the other of these materials have set forth their properties, it was felt by the author that a broader comparative presentation among the fluorocarbon group members would prove useful to engineers concerned with insulating problems.**

## Introduction

**Until** early 1956, wire and cable users who required non-flammable, truly heat-resistant, plastic insulations had essentially only two choices, both members of the fluorocarbon family: "Teflon"* polytetrafluoroethylene, or "Kel-F"** polychlorotrifluoroethylene. Differences in performance properties between these two types of insulation were well recognized, and separate hookup wire specifications for the two materials as wire insulations had long been in force by various military and non-military groups.

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**About** two and one-half years ago, however, the DuPont Company disclosed an entirely new member of the fluorocarbon group, Teflon-100X, or, as it has been renamed, "FEP." Immediately many realized that 100X-FEP, by virtue of its excellent thermal, chemical, and electrical properties would also be an extremely useful electrical insulating material. Indeed, it was found that the new resin, when employed as a hookup wire insulation, usually produced a construction capable of meeting or exceeding the requirements of not only the MIL specification used in describing Kel-F hookup wire, but also the one describing Teflon hookup wire as well.

★ ★ ★

**These** facts were quite properly given considerable publicity. But the promotional effort has been so effective that some unwarranted confusion has arisen among those responsible for specifying and using wires and cables. Should 100X-FEP be specified to replace conventional Teflon-6 (now renamed "TFE") in applications where the latter now serves well? Ought 100X-FEP to replace Kel-F? If the two older materials are to be replaced in certain applications, which are these applications? The answers to these questions cannot ignore that 100X-FEP is now in extremely limited supply, a temporary situation that will exist until late 1959.

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**Surprenant Mfg. Co.** pioneered the use of extruded Kel-F and Teflon-6 TFE as wire insulations. The same firm was thus selected to be the first organization outside the duPont Company to evaluate the commercial wire and cable insulation possibilities of Teflon 100X-FEP. In the two and one half years since this material was originally extruded at Surprenant, many performance data concerning it have been amassed. These data compare 100X-FEP as primary insulation and cable-jacket with the older conventional Teflon-6 TFE and with Kel-F 500, the grade now used most frequently in wire and cable applications. From the information thus gathered a pattern has emerged, which places the new insulating material in proper perspective with each of the others. The purpose of this paper is to supplement articles that have appeared in the literature[3, 4], which describe the general properties and advantages of 100-X FEP. These data are intended to enable the prudent wire and cable user, who wishes to specify and obtain the most appropriate insulating material for his application, to achieve his goal more effectively.

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**Teflon**-100X FEP and Kel-F 500 are melt-extrudable copolymers, the former having a completely fluorinated molecular structure, the latter containing chlorine as well as fluorine atoms. Teflon-6 TFE is a completely fluorinated homopolymer, with such a high viscosity in the gel state that it is not melt-extrudable by conventional means. While all three of these materials are useful as electrical wire and cable insulations, the practical upper temperature limits for each of them must be considered in some detail, and other properties which distinguish the individual members of the fluorocarbon group from each other also require investigation. The resins are discussed separately as primary insulations and as jacketing materials. Unfortunately, the performance-properties of greatest interest can safely be determined only by time-consuming empirical methods.

## Primary Insulation Comparisons

**Samples** selected for studies of upper temperature limits as primary insulations were as follows:

| | |
|---|---|
| 1. Teflon-6: (TFE) | Surprenant Catalog No. WTE 730A (MIL-W-16878C, Type E-22) 7 Strands silver-plated copper conductor (#30 AWG) |

* "Teflon" is a registered trademark of E. I. duPont de Nemours and Company, Inc.

** "Kel-F" is a registered trademark of Minnesota Mining and Manufacturing Company.

11 mil wall of extruded Teflon-6: o.d. 0.052"

2. Teflon-100X: (FEP) Surprenant Catalog No. WTM 730A
7 Strands #30 silver-plated copper conductor
11 mil wall of extruded Teflon-100X: o.d. 0.052"

3. Kel-F 500: Surprenant Catalog No. WKF 730 A (MIL-W-12349, KF 22 (7C) U)
7 Strands silver-plated copper conductor (#30 AWG)
10 mil wall of Kel-F 500: o.d. 0.051"

## Mandrel Flow at Elevated Temperatures

**Samples** of each type of insulated wire 12 inches long were stripped of insulation for ¾ inch on each end and hung over a ½ inch mandrel in a forced air oven. (See Figure 1.) The stripped ends

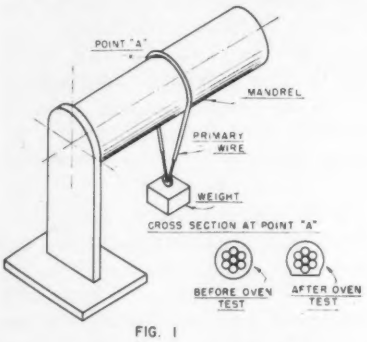


FIG. 1

were twisted together under the mandrel and a weight was attached to the joined ends. The mandrel and samples were placed in an oven for ½ hour, and then removed and allowed to cool to room temperature. Each sample was then cut at the point of contact with the mandrel, the insulation stripped, and a thin section sliced with a sharp blade. This section was examined under a toolmaker's microscope and the reduction in cross section at the point of contact with the mandrel was measured. The initial concentricity of the samples was between 86% and 96%. Results were as indicated on Table I. (The heavier weights were employed primarily for comparison purposes only, not necessarily with the implication that 3 and 6 lb loadings would represent normal tensions to be placed upon insulated copper wires of this size in service. Nevertheless, where high strength alloys are used as conductors, appreciable tensile loading of insulated wires of moderate size is not now an unheard of practice.)

★ ★ ★

At temperatures as high as 275°C (527°F) no flow in the case of Teflon-6 TFE insulation was noted, even under considerable load. On the basis of flow properties alone, it would seem that while Teflon-6 TFE as a primary insulation is useful at 250°C or above, Teflon-100X FEP would be limited to the 190° - 200°C range, and Kel-F to the 150°C range or below.

## Chisel Penetration at Elevated Temperature

**This** test simulates operating conditions wherein an insulated wire would be pulled taut across a sharp chassis edge at elevated temperature. An electrically heated metallic wedge approximately 1½" wide was mounted in a vise with the sharp chisel edge up. (See Figure 2.) The chisel point

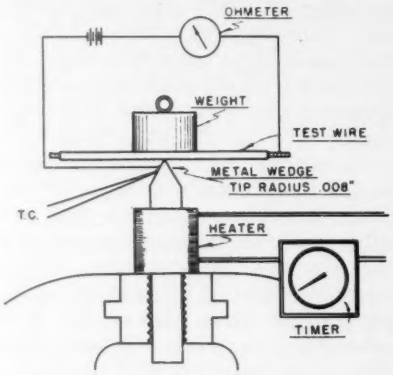


FIG. 2

had a radius of approximately 8 mils. The wire under test was laid across the chisel edge, horizontal and perpendicular to the chisel. A ¾-pound weight was then lowered on the wire, and the time for complete penetration

TABLE I

PRIMARY INSULATION COLD-FLOW AT ELEVATED TEMPERATURES

| Primary Insulation | Oven Temperature °C | Weight (Pounds) | Reduction in Wall Thickness -- Mils | Comments |
|---|---|---|---|---|
| Kel-F 500 | 150 | 3/4 | None | Kel-F 500 |
| 100X-FEP | | 3/4 | None | |
| Kel-F 500 | | 3 | 2.4 | Using the 3-lb. loading, |
| 100X-FEP | | 3 | None | flow was measured with |
| Kel-F 500 | 175 | 3/4 | None | Kel-F at temperatures as |
| 100X-FEP | | 3/4 | None | low as 150°C. |
| Kel-F 500 | | 3 | 3.7 | |
| 100X-FEP | | 3 | None | |
| Kel-F 500 | 190 | 3/4 | Less than 1.0 | |
| 100X-FEP | | 3/4 | None | |
| Kel-F 500 | | 3 | 8.4 | Teflon-100X FEP |
| 100X-FEP | | 3 | 1.3 | |
| Kel-F 500 | 200 | 3/4 | Shorted out | Using the 3/4-lb. loading, |
| Te-6 TFE | | 3/4 | None | flow was measured with |
| 100X-FEP | | 3/4 | 1.2 | Teflon-100X FEP at 200°C |
| Te-6 TFE | | 3 | None | and above. Using the 3-lb. |
| 100X-FEP | 3 | 3 | 3.7 | loading, flow was measured |
| Te-6 TFE | | 6 | None | at and above 190°C. |
| 100X-FEP | | 6 | 1.7 | |
| Te-6 TFE | 225 | 3/4 | None | |
| 100X-FEP | | 3/4 | 2.0 | Teflon-6 TFE |
| Te-6 TFE | | 3 | None | |
| 100X-FEP | | 3 | 3.4 | There was no visible flow |
| Te-6 TFE | | 6 | None | in the case of Teflon-6 TFE |
| 100X-FEP | | 6 | Shorted out | for any of the configurations |
| Te-6 TFE | 250 | 3/4 | None | tested. |
| 100X-FEP | | 3/4 | 2.4 | |
| Te-6 TFE | | 3 | None | |
| 100X-FEP | | 3 | Shorted out | |
| Te-6 TFE | | 6 | None | |
| 100X-FEP | | 6 | Shorted out | |
| Te-6 TFE | 275 | 3/4 | None | |
| 100X-FEP | | 3/4 | 1.6 | |
| Te-6 TFE | | 3 | None | |
| 100X-FEP | | 3 | Shorted out | |
| Te-6 TFE | | 6 | None | |
| 100X-FEP | | 6 | Shorted out | |

through the insulation was measured. The wedge temperature was measured by means of an iron-constantan thermocouple placed on the face of the wedge just below the sample. Complete breakthrough of the insulation was indicated by an ohmmeter connected between the wedge and the conductor of the sample. Four determinations were made for each test, with averages as reported in Table II. The penetration test results came as no surprise following the flow test results. Once again, Teflon-6 TFE showed vast superiority over either of the other two materials. Teflon-100X FEP also demonstrated considerable superiority over the equivalent Kel-F 500 insulation.

TABLE II

PRIMARY INSULATION PENETRATION AT ELEVATED TEMPERATURES

(Loadings: 3/4 Pound in all determinations. See Fig. 2)

| Sample | Wedge Temperature °C | Time to Penetrate (Seconds) |
|---|---|---|
| Kel-F 500 | 150 | 3 Seconds |
| 100X-FEP | 150 | Test discontinued at 15 min. |
| Kel-F 500 | 175 | 3 Seconds |
| 100X-FEP | 175 | 7 Minutes |
| Kel-F 500 | 190 | Cut through immediately |
| 100X-FEP | 190 | 63 Seconds |
| Kel-F 500 | 200 | Cut through immediately |
| Te-6 TFE | 200 | No penetration in 5 min. - Test discontinued |
| 100X-FEP | 200 | 42 Seconds |
| Te-6 TFE | 216 | No penetration in 5 min. - Test discontinued |
| 100X-FEP | 216 | 41 Seconds |
| Te-6 TFE | 334 | 29 Seconds |
| 100X-FEP | 334 | Less than 1 second |

## Solder—Iron Contact

It is well known that much Teflon-6 TFE primary insulation is used solely because of its ability to withstand contact with a hot solder iron during installation and servicing operations and remain undamaged. To confirm this relative advantage over the other two materials, a simple test was performed: A wire sample was placed on a piece of hard asbestos insulation, and a soldering iron was positioned with the hot face directly on the insulation. (See Figure 3.) The iron was hinged at the rear of the handle, the iron making an angle of approximately 45° with the asbestos surface and producing a measured force of the tip on the wire of 0.69 pounds. The iron, which was rated at 80 watt, was operated at 117 volts and had a surface temperature of 377°C. The time required to melt through to the conductor was measured. The indication of contact between the tip and the conductor was obtained on an ohmmeter connected between the conductor and the soldering iron. Four readings were obtained in each case, with the following results:

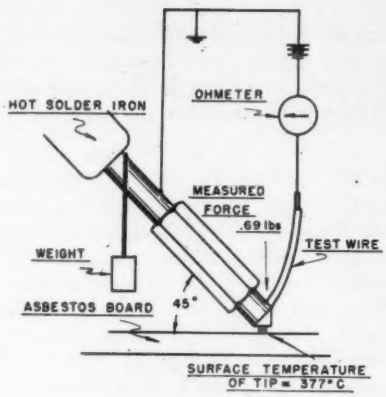


FIG. 3

| Primary Insulation | Time to Failure— |
|---|---|
| Kel-F | Less than 0.8 seconds |
| Teflon-100X FEP | 0.8 seconds |
| Teflon-6 TFE | No penetration after 5 minutes. Test discontinued. |

## Teflon-6 TFE Primary Insulation—Usefulness at 250°-300°C

The above data demonstrate the inadvisability of using either of the two melt-extrudable materials in the temperature region above 200°C or where direct solder-iron contact must be endured. But Teflon-6 TFE, insofar as flow behavior under load is concerned, should be dependable as a primary insulation at temperatures well above 200°C. For this reason, the additional heat-aging data presented in Tables III through VI were obtained on samples of extruded Teflon-6 TFE at temperatures from 250°C to 300°C. The usefulness of extruded Teflon-6 TFE primary insulation in these ranges involves a time-temperature consideration; eventual lowering of the dielectric properties of the insulation following very long-term exposure to these temperatures was noted. The occasional failures indicated in the tabulations occurred only following truly protracted aging periods or exposure to the 300°C aging temperature. They appeared among the specimens having heavier insulation walls, undoubtedly because any slight embrittlement or stiffening of the Teflon-6 TFE would be emphasized in mandrel-bend tests conducted on these specimens. Regardless of one or two widely scattered failures, however, this evidence shows that considerable service-life for Teflon-6 TFE primary insulation does exist at temperatures well above 200°C and perhaps approaching 300°C in certain cases. Data to support this conclusion have already appeared in the literature.[5]

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It should be borne in mind, however, that these temperatures exceed the capabilities of conventional silver plating. Where such exposures are anticipated, the use of nickel plating in preference to the more conventional silver plating is strongly recommended. Nickel plating is now specifically permitted in MIL-W-16878C, paragraph 3.2.2.

## Primary Insulation Abrasion Resistance

Abrasion resistance is well

TABLE III

TEFLON-6 TFE PRIMARY INSULATION: AGED @ 250°C (480°F)

Three 18 inch specimens were tested in each group. Specimens were suspended for the stated intervals in loose coil form in an oven maintained at 250°C. Upon removal, the specimens were individually bent for 6 close turns around a mandrel 2 times the overall wire diameter, soaked for one hour in a solution containing 0.5% alconox wetting agent, and test voltage was then applied at the rate of 500 volts per second, until the appropriate dielectric test voltage was reached. This voltage was held for one minute and then increased at the same rate until breakdown occurred. Voltages indicated represent the average of the specimens withstanding the one-minute test.

| | WIRE 732 A 0.046-0.050" o.d. Red | WIRE 732 A 0.055-0.057" o.d. Red | WIRE 726 A 0.061" o.d. Orange | WIRE 728 A 0.067" o.d. Violet | WIRE 1929 A 0.065-0.067" o.d. Red | WIRE 1929 A 0.092" o.d. Brown |
|---|---|---|---|---|---|---|
| Aging Period | NAS-703 Type C | NAS-703 Type A | NAS-703 Type C | NAS-703 Type A | NAS-703 Type C | NAS-703 Type A |
| 47 Days 1128 Hours | OK 2500 V/1 Min. BD @ 8.5 Kv | OK 3000 V/1 Min. BD @ 13.0 Kv | 2 of 3 OK 2500 V/1 Min. BD @ 7.1 Kv | OK 3000 V/1 Min. BD @ 13.0 Kv | OK 2500 V/1 Min. BD @ 10.0 Kv | OK 3000 V/1 Min. BD @ 12.5 Kv |
| 101 Days 2424 Hours | OK 2500 V/1 Min. BD @ 7.5 Kv | 1 of 3 OK 3000 V/1 Min. BD @ 10.0 Kv | OK 2500 V/1 Min BD @ 5.5 Kv | OK 3000 V/1 Min. BD @ 8.0 Kv | OK 2500 V/1 Min. BD @ 7.0 Kv | 1 of 3 OK 3000 V/1 Min. BD @ 8.0 Kv |
| 172 Days 4128 Hours | OK 2500 V/1 Min. BD @8.5 Kv | OK 3000 V/1 Min. BD @ 8.0 Kv | 2 of 3 OK 2500 V/1 Min. BD @ 6.0 Kv | OK 3000 V/1 Min. BD @ 10.5 Kv | OK 2500 V/1 Min. BD @ 6.0 Kv | 2 of 3 OK 3000 V/1 Min. BD @ 8.5 Kv |

TABLE IV

TEFLON-6 TFE PRIMARY INSULATION: AGED @ 260°C (500°F)

Three 18 inch specimens were tested in each group. Specimens were suspended for the stated intervals in loose coil form in an oven maintained at 260°C. Upon removal, the specimens were individually bent for 6 close turns around a mandrel 2 times the overall wire diameter, soaked for one hour in a solution containing 0.5% alconox wetting agent, and test voltage was then applied at the rate of 500 volts per second, until the appropriate dielectric test voltage was reached.* This voltage was held for one minute and then increased at the same rate until breakdown occurred. Voltages indicated represent the average of the three specimens. Breakdown voltage determinations were made on samples which had not been subjected to the aging cycle as well as the heat aged samples.

| Aging Period | RTE 2726A 0.126" o.d. Natural MIL-W-16878 Type EE | RTE 1929A 0.095" o.d. Grey MIL-W-16878 Type EE | WTE 730A 0.058" o.d. Red MIL-W-16878 Type E | WTE 1936A 0.045" o.d. Yellow MIL-W-16878 Type E |
|---|---|---|---|---|
| Unaged | OK 3000V/1 Min. BD @ 10.0 Kv | OK 3000V/1 Min. BD @ 11.0 Kv | OK 2000V/1 Min.* BD @ 7.0 Kv | OK 2000V/1 Min.* BD @ 8.5 Kv |
| 160 hours | OK 3000V/1 Min. BD @ 8.5 Kv | OK 3000V/1 Min. BD @ 9.0 Kv | OK 2000V/1 Min. BD @ 5.5 Kv | OK 2000V/1 Min. BD @ 8.0 Kv |
| 336 hours | OK 3000V/1 Min. BD @ 8.5 Kv | OK 3000V/1 Min. BD @ 7.5 Kv | OK 2000V/1 Min. BD @ 6.0 Kv | OK 2000V/1 Min. BD @ 8.0 Kv |
| 504 hours | OK 3000V/1 Min. BD @ 7.5 Kv | OK 3000V/1 Min. BD @ 6.0 Kv | OK 2000V/1 Min. BD @ 6.5 Kv | OK 2000V/1 Min. BD @ 6.5 Kv |
| 672 hours | OK 3000V/1 Min. BD @ 7.5 Kv | OK 3000V/1 Min. BD @ 5.0 Kv | OK 2000V/1 Min. BD @ 4.0 Kv | OK 2000V/1 Min. BD @ 7.0 Kv |
| 840 hours | OK 3000V/1 Min. BD @ 8.0 Kv | OK 3000V/1 Min. BD @ 5.5 Kv | OK 2000V/1 Min. BD @ 4.0 Kv | OK 2000V/1 Min. BD @ 6.5 Kv |

*At the time these data were obtained, "B" revision of MIL-W-16878 was in force, and the 1 minute dielectric test voltage requirement for type E wire was 2000 Volts.

TABLE V

TEFLON-6 TFE PRIMARY INSULATED WIRE: AGED @ 275°C (527°F)

Three 18 inch specimens were tested in each group. Specimens were suspended for 96 hours in loose coil form in an oven maintained at 275°C. Upon removal, the specimens were individually bent for 6 close turns around a mandrel 2 times the overall wire diameter, soaked for one hour in a solution containing 0.5% alconox wetting agent. The test voltage was then applied at the rate of 500 volts per second, until the appropriate dielectric test voltage was reached. This voltage was held for one minute and then increased at the same rate until breakdown occurred. Voltages indicated represent the average of the three specimens. Breakdown voltage determinations were made on samples which had not been subjected to the aging cycle as well as the heat aged samples.

| AWG | Catalogue No. | Color | Unaged | Aged 96 hours at 275°C |
|---|---|---|---|---|
| 26 | WTE 734A | White | OK 2.5Kv/1 Min. BD 7.5 Kv | OK 2.5 Kv/1 Min. BD 8 Kv |
| | RTE 734A | Red | OK 3.0 Kv/1 Min. BD @ 11.5 Kv | OK 3.0 Kv/1 Min. BD @ 11.5 Kv |
| 20 | WTE 1932A | Yellow | OK 2.5 Kv/1 Min. BD @ 8 Kv | OK 2.5 Kv/1 Min. BD @ 7.5 Kv |
| | RTE 1932A | Green | OK 3.0 Kv/1 Min. BD @ 10 Kv | OK 3.0 Kv/1 Min. BD @ 10 Kv |
| 16 | WTE 1929A | Blue | OK 2.5 Kv/1 Min. BD @ 8 Kv | OK 2.5 Kv/1 Min. BD @ 9.5 Kv |
| | RTE 1929A | Grey | OK 3.0 Kv/1 Min. BD @ 8 Kv | OK 3.0 Kv/1 Min. BD @ 7.5 Kv |
| 14 | WTE 1927A | Brown | OK 2.5 Kv/1 Min. BD @ 10.5 Kv | OK 2.5 Kv/1 Min. BD @ 10 Kv |
| | RTE 1927A | Black | OK 3.0 Kv/1 Min. BD @ 10 Kv | OK 30 Kv/1 Min. BD @ 10.5 Kv |

TABLE VI

TEFLON-6 TFE PRIMARY INSULATION: AGED @ 300°C (572°F)

Samples were immersed for a period of 4 hours in an aqueous solution containing 0.5% aerosol wetting agent (alconox), then given the dielectric test. Another length of the same wire from the same spool was aged 4 days (96hrs.) at 300°C, then wrapped on a mandrel 3 times the wire diameter and given the same dielectric test in accordance with the procedure of Table III. WTE samples, NAS-703, Type C wire, were held at 2500 V for one minute; RTE samples (Type A wire) were held at 3000 V for one minute before the voltage was raised to failure.

| AWG | Cat. No. | Breakdown Voltage Original | Aged |
|---|---|---|---|
| 30 | WTE 736A | 9.0 Kv | 7.5 Kv |
| | RTE 736A | 10.5 Kv | 11.5 Kv |
| 28 | WTE 736A | 9.5 Kv | 9.5 Kv |
| | RTE 736A | 11.0 Kv | 8.0 Kv |
| 26 | WTE 734A | 8.5 Kv | 7.5 Kv |
| | RTE 734A | 9.0 Kv | 8.0 Kv |
| 24 | WTE 732A | 11.0 Kv | 10.0 Kv |
| | WTE 1936A | 6.5 Kv | 8.5 Kv |
| | RTE 732A | 10.0 Kv | 8.0 Kv |
| 22 | WTE 730A | 10.5 Kv | 10.0 Kv |
| 22 | RTE 730A | 9.5 Kv | 7.0 Kv |
| | RTE 1934A | 6.5 Kv | 8.0 Kv |
| 20 | WTE 728A | 11.0 Kv | 6.0 Kv |
| | WTE 1932A | 11.5 Kv | 9.5 Kv |
| 20 | RTE 728A | 8.0 Kv | 8.0 Kv |
| | RTE 1932A | 5.5 Kv | 6.0 Kv |
| 18 | WTE 726A | 7.0 Kv | 6.5 Kv |
| | WTE 1930A | 11.5 Kv | 9.5 Kv |
| 18 | RTE 726A | 8.5 Kv | 6.0 Kv |
| | RTE 1930A | 4.5 Kv | 7.0 Kv |
| 16 | WTE 1929A | 11.0 Kv | 3.5 Kv |
| | RTE 1929A | 10.0 Kv | 7.0 Kv |
| 14 | RTE 1927A | 11.5 Kv | 1.0 Kv |
| 12 | RTE 1925A | 8.5 Kv | 7.5 Kv |
| 10 | RTE 3726A | 3.5 Kv | 6.0 Kv |

recognized as an important characteristic of wire insulation, and the MIL-T-5438 Tester (see Figure 4) has been helpful in its evaluation. Typical comparative abrasion-resistances of the three fluorocarbon materials are indicated in Table VII. For approximately

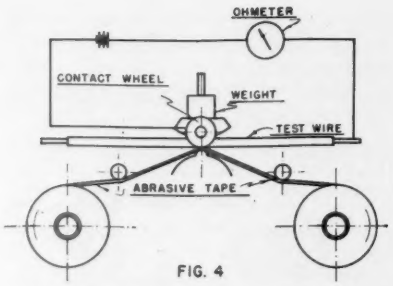


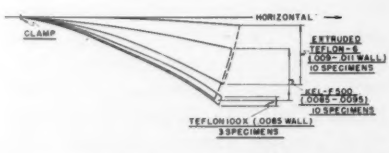

FIG. 4

equal wall-thicknesses, abrasion-resistances were of the same order regardless of the insulating resin. Although Teflon-6 TFE showed slightly less abrasion resistance than the other two materials, the differences were actually too small to imply true practical importance. The limited data which have already appeared in the literature support the comparison between the TFE and FEP Teflon materials.[4] It has also been shown elsewhere that if such materials are exposed to sufficient thermal abuse to cause appreciable polymer degradation, the abrasion-resistance is correspondingly decreased. Thermal softening of the materials would also no doubt reduce their abrasion-resistance at elevated temperatures. The latter has not as yet been confirmed experimentally, but it is highly probable, for example, that at temperatures in the 250°C range Teflon-6 TFE would definitely surpass the 100X-FEP in abrasion-resistance.

## Relative Flexibility

**Flexibility** in an insulated wire can be difficult to assess quantitatively, although a test method sometimes used is that indicated in Figure 5. Here a wire sample

FIG. 5




of given length and wall thickness is suspended horizontally from one of its ends while a known weight is attached to the other end, and a tracing is made of the curve described by the specimen thus permitted to bend freely by

TABLE VII

ABRASION RESISTANCES: TEFLON-100X FEP, TEFLON-6 TFE, AND KEL-F 500 as PRIMARY INSULATIONS

Apparatus Used: MIL-T-5438 Abrasion Tester, 400 grit garnet cloth, marked with 1/4" wide silver paint stripes every three inches, brackets and weights as indicated.

| Specimen AWG Stranding Conductor o.d. | #24* 19/36 0.025" | | | #22* 7/30 0.030" | | | #16** 27/30 0.057" | | #16** 19/29 0.054" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Insulations: | 100X-FEP | Te-6 TFE | Kel-F 500 | 100X-FEP | Te-6 TFE | Kel-F 500 | Te-6 TFE | Kel-F 500 | Te-6 TFE | Kel-F 500 |
| Avg. wall @ Pt. of Failure: | 0.0085" | 0.0113" | 0.0113" | 0.0090" | 0.0102" | 0.0085" | 0.0137" | 0.0133" | 0.0123" | 0.0117" |
| | 24 | 36 | 36 | 33 | 30 | 21 | 36 | 33 | 24 | 27 |
| | 24 | 21 | 36 | 36 | 36 | 21 | 42 | 45 | 27 | 30 |
| | 27 | 39 | 36 | 30 | 33 | 24 | 27 | 45 | 30 | 24 |
| | 27 | 54 | 36 | 36 | 36 | 24 | 33 | 36 | 21 | 27 |
| | 24 | 27 | 42 | 33 | 30 | 21 | 48 | 39 | 21 | 27 |
| | 24 | 30 | 36 | 39 | 36 | 21 | 24 | 42 | 21 | 30 |
| | 24 | 27 | 30 | 36 | 33 | 24 | 27 | 36 | 24 | 27 |
| | 24 | 27 | 33 | 33 | 42 | 21 | 57 | 33 | 24 | 24 |
| Avg. of all Readings less than Numerical Average: | 24 | 26.4 | 31.5 | 32.2 | 31.5 | 21 | 29.4 | 34.5 | 22.5 | 26 |

* "A" Bracket, 1/2 lb. weight.

** "B" Bracket, 1 lb. weight.

TABLE VIII

PRIMARY INSULATION FLEX LIFE: TEFLON-6 TFE, TEFLON-100X FEP, KEL-F 500

| Test Specimen | Cycles* to Failure - Lug Attached See Figure 6A | | | Cycles* to Failure - Without Lug See Figure 6B | | |
|---|---|---|---|---|---|---|
| AWG, Stranding: | #22, 7/30 | #24, 19/36 | #22, 19/34 | #22, 7/30 | #24, 19/36 | #22, 19/34 |
| Diameter Stranded Conductor: | 0.030" | 0.025" | 0.030" | 0.030" | 0.025" | 0.030" |
| Insulation Wall, mils: | 8.5 - 9.5 | 9.5 - 10 | 16 | 8.5 - 9.5 | 9.5 - 10 | 16 |
| Ratio Ins. Wall / Cdr. Diam. | 0.3 | 0.4 | 0.5 | 0.3 | 0.4 | 0.5 |
| **INSULATION** | **FLEXES TO FAILURE** | | | | | |
| Teflon 100X-FEP: | | | | | | |
| High | 122 | 66 | 508 | 68 | 74 | 294 |
| Low | 100 | 37 | 256 | 55 | 56 | 194 |
| $Avg_5$ | 117 | 51 | 404 | 63 | 64 | 250 |
| Teflon-6 TFE: | | | | | | |
| High | 174 | 227 | 2316 | 83 | 222 | 721 |
| Low | 81 | 140 | 827 | 74 | 142 | 486 |
| $Avg_5$ | 117 | 166 | 1437 | 77 | 178 | 594 |
| Kel-F 500: | | | | | | |
| High | 166 | 150 | 460 | 87 | 102 | 255 |
| Low | 97 | 113 | 358 | 56 | 65 | 166 |
| $Avg_5$ | 127 | 135 | 405 | 72 | 81 | 207 |

*Note: 1 cycle = 2 complete flexes, one in each direction, 110° included angle of arc; 0.5 lb tensile loading in all determinations.

the force of gravity. It will be observed from the information in Figure 5 that the curves for the three insulated wires overlap each other to a great extent. All three materials, which of course are rigid non-elastomers, when compared as primary insulations produce wires which fall in the same general flexibility range, and measured differences between any two isolated specimens would lack significance. Published literature[3] does show approximately 5% higher flexural modulus for 100X-FEP than for Teflon-6 TFE based on quenched, molded specimens, but this small difference proves practically impossible to detect among insulated wire specimens.

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## Primary Insulation Flex Life

**Flex-life** is an all-important consideration in comparing the three fluorocarbon materials, since differences in this property have a direct bearing on the service life of the equipment utilizing the wire. Table VIII compares the three different types of insulated wire under two of the more common conditions of flexing. The apparatus used was set up as shown in Figures 6A and 6B. In the first test, the wires were crimped into solderless lugs, type AMP #32053, and the lugs grasped in the jaws of a flexing jig so that flexing would occur at the point where the insulation end directly abutted the shank of the lug. The samples were placed under a tension of 0.5 pounds and repeatedly bent through an arc of 110° until failure occurred. Five determinations were performed on each type and size of wire with results and averages as shown in the left-hand columns of Table VIII.

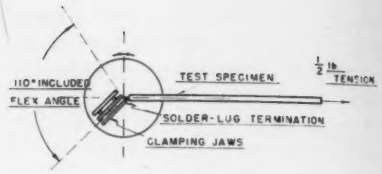


FIG. 6A

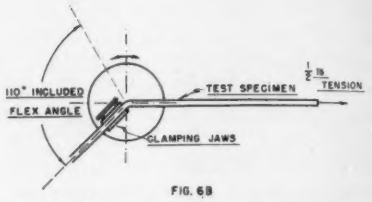


FIG. 6B

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**In** the three right-hand columns of Table VIII, we consider the same type of test equipment rigged as in Figure 6B without use of lugs of any type. Thus, differences in flex-life would be solely dependent upon the relative abilities of the different constructions under comparison to withstand repeated bends at points along their length, without the complicating side-effects due to termination. The overwhelming majority of flex failures in service occur at or near points of termination but within this group there are many instances where insulated wires installed in chasses are moved repeatedly on hinge devices during the life of the equipment. In such cases service conditions approximated as in Figure 6B would exist.

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**In** contrast to the flexibility comparison, a recognizeable pattern did evolve from this study. Regardless of test method, failure invariably occurred as an eventual breaking of the conductor at the point where the specimen was clamped into the jaws. With terminal lugs attached, slight variations among the specimens because of method of lug attachment, tightness of crimp, etc. were bound to occur; these reduced the differences detected among the three insulations. But where test con-

ditions favored a spread in flex-life differences, the Teflon-6 TFE definitely outlasted the other two materials. This trend is observed in 5 of the 6 configurations studied, and showed most clearly where the ratio of insulation wall thickness to conductor diameter was 0.4 or greater. (It is perhaps unnecessary to state that horizontal comparisons of data in Table VIII are of extremely limited significance, since the thickness-diameter ratio and stranding configurations are dissimilar from column to column.) The flex-life advantage of extruded Teflon-6 TFE here demonstrated is considered significant, however, it is obviously not of comparable magnitude to the superiority of this material in thermal flow applications.

### Jacket Comparisons

In our discussion of the three materials as jackets over shielded inner cores, the Teflon-6 TFE is evaluated in tape-wrapped form rather than extruded. Since by far the greatest quantity of Teflon-6 TFE jacket produced today does consist of multiple layers of wrapped and fused TFE tape, this is now the standard Teflon-6 TFE jacket construction.

### Mandrel Flow at Elevated Temperature

To study relative flow-behavior at high temperatures under conditions of known compressive stress loading, a mandrel test was conducted. The mandrel, 1½ inches in diameter, was firmly supported in a horizontal position, and over it were hung sections of cable, all similar to each other except for the outer jackets. Each end of each test specimen was attached to a loading weight of known magnitude. In every case, equal weights were attached to both ends, (see Figure 7). The fixture was then set in a test oven for various arbitrarily chosen periods of time, and then carefully removed and permitted to return to room temperature. The weights were then detached from the specimen; it was immersed in a grounded electrolyte solution, and a dielectric test-voltage test was applied across the jacket from

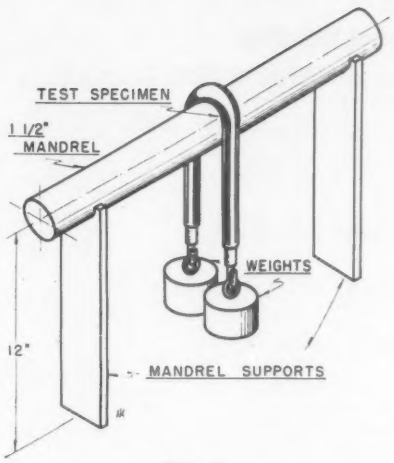


FIG. 7

shield to ground. The voltage was raised from zero to 1.5 Kv at the rate of 500 volts/second and the 1.5 Kv rms voltage was applied for one minute. The voltage was then raised at the same rate until dielectric failure occurred. An indication was thus obtained of the ability of the jacket to withstand a given compressive thrust against the standard mandrel for a definite period of time at a certain temperature.

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Most of the specimens used were circular in cross-section with jacket wall thicknesses over the shield representing something near the minimum practical for standard service. The nominal wall thicknesses of the Kel-F 500 and Teflon-100X FEP jackets were 0.008", while that for the tape-wrapped Teflon was nominally 0.010". Some tests were also made on various jacketed specimens of non-circular cross-sectional area, but because of the number of combinations and permutations of conditions and specimens which would thus be introduced, it was impossible to investigate this variable exhaustively. It was found that the further the cross-sectional area departed from a truly circular shape (two-conductor cable representing the most complete departure), the more erratic the test results were likely to be. This occurred because it ordinarily would be a matter of chance whether the compressive force from the weights was applied along the relatively small "high point" on the jacket or spread more evenly along an axis parallel to the major cable diameter. (See Figure 8: Compressive stress at point "A" is somewhat more than twice as great as at either point "B".) Just how er-

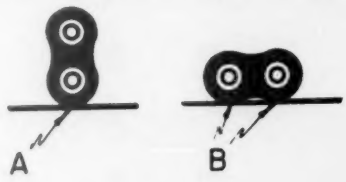


FIG. 8

ratic the results with non-round cross-sections would be was found to depend also on the ratio of the mandrel diameter to the diameter of the specimen under test. The greater this ratio, the less erratic were the effects of a non-round cross-section. The findings were generally that the two-conductor configuration represented a more stringent test than that of the circular cross-section. In any case, it appeared that three or more conductor cables twisted concentrically produced cross-sections nearly enough circular so that readings obtained from them would not greatly differ from those resulting from a truly round cross-section. In Figure 9, cable "C", a five-conductor construction, has an outer jacket surface which comes closer to a circular shape than does the jacket on the two-conductor construction of cable "B".

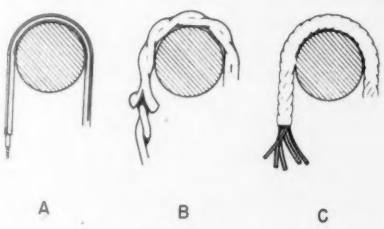


FIG. 9

Practically all cables tested in the main part of the investigation were coaxial cables utilizing a relatively heavy wall of extruded Teflon-6 as a primary dielectric. Results obtained are shown in Table IX, wherein the numeral indicates the jacket breakdown voltage in Kv following the indicated temper-

TABLE IX

JACKET FLOW AT ELEVATED TEMPERATURE

| Type Jacket | Oven Temp., °C | Hrs. in Oven | Load Weight in Pounds 1 | 3 | 6 | 8 | 10 |
|---|---|---|---|---|---|---|---|
| Teflon-6 TFE Tape | 270 | 72 | | | | 8.5* | |
| | 300 | 24 | | | 10.0<br>0.5* | 10.0 | 8.5* |
| | 325 | 24 | | | 9.0 | 8.0 | 0.0* |
| | | 72 | | 10.0 | 0.0** | | |
| | 350 | 4 | | | 0.0 | | |
| | | 24 | 10.5* | 9.0 | | | |
| | | 72 | | 0.0** | | | |
| | 375 | 24 | 0.0/ | | | | |
| | 400 | 24 | 0.0* | | | | |
| Teflon-100X FEP Extruded | 175 | 24 | | 15.0 | | | |
| | | 72 | | 10.5 | | | |
| | 190 | 24 | | | | 9.0 | 12.0 |
| | | 72 | 8.5 | 2.0 | | 0.0 | 0.0 |
| | 200 | 72 | 10.5 | | | | |
| | 250 | 24 | | 10.0 | | | 0.0 |
| | | 48 | 7.5 | 0.0 | 0.0 | | |
| | | 72 | 7.2 | | | | |
| | | 168 | 2.8 | | | | |
| | 285 | 24 | 0.0 | | | | |
| | 300 | 24 | | 0.0 | | | |
| Kel-F 500 Extruded | 175 | 24 | | 10.0 | 2.0 | 0.0 | |
| | | 72 | | | 1.5 | | 0.0 |
| | 190 | 4 | | | 0.0 | | |
| | | 16 | | | | 0.0 | |
| | | 24 | | 0.0 | | | |
| | | 72 | | 0.0 | | | |

*Determined on 3-cdr specimen; same wall thickness and diam. as other Te-6 TFE specimens.

**Tensile failure

/0.5 lb loading used.

ature-time cycle, and the successful application of 1.5 Kv for one minute. It would be a mistake to attach significance to differences among these breakdown voltages in the order of 5 to 6 Kv or less. The truly significant factors are the differences between total inability to hold even the 1.5 Kv test voltage in some specimens and other specimens which did not fail until voltages of several Kv were reached. In one or two cases where the Teflon tape jacket was tested at fairly heavy loads at temperatures above it gel point (327°C), the test was prematurely concluded by a type of tensile failure wherein the interior Teflon-6 TFE and outer tape jacket became soft enough to "string-out," depositing the weights on the floor of the oven, and leading to indeterminate jacket flow observations. These occurrences are appropriately indicated in the table. Weights as great as 10 pounds are truly realistic for cable applications where tensile loads must be endured, however in many practical cases the actual numerical value of the applied tensile loading is difficult or impossible to determine beforehand with confidence.

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**Interesting** pictures result when these data are presented in graphic form as indicated for the 24 and 72 hour periods in Figures 10A and 10B. Based on failing and passing specimens of each of the three jacket materials, it is reasonable to sketch in approximate borderline areas separating permissible operating conditions from those too severe for each time interval considered. Note that the separating lines for the two melt-extruded materials, Teflon-100X FEP and Kel-F 500, do not cross the corresponding melting temperature lines for these resins regardless of how light the applied load is. It would be impossible to employ them at temperatures above their respective melting temperatures, under any circumstances whatsoever.

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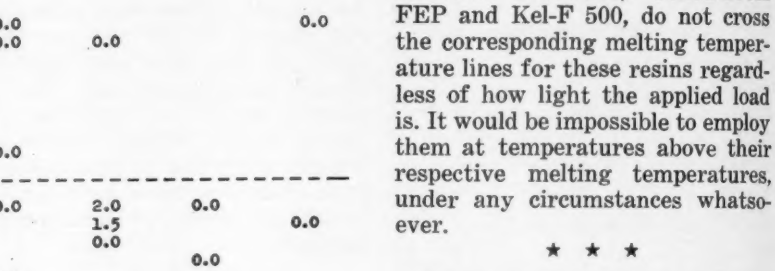
**The** boundary line for Teflon-6 TFE jacket, however, crosses its own gel temperature level quite decisively, the implication being that at least under certain conditions this material would be useful for finite intervals at temperatures above 327°C. On both plots the boundary curves have been sketched to pass through or just above certain points which represent borderline operating conditions. In these cases, the dielectric

FIG. 10A

FIG. 10B




JACKET FLOW CHARACTERISTICS

strength of the jacket is reduced, but not to zero. Quite likely prolonged exposure at the same loadings and temperatures would result in complete flow failures.

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When Figure 10B is compared with Figure 10A an obvious change is noted. The extended time of exposure causes the Teflon-6 TFE and Kel-F 500 boundary areas to shift downward, but the position of the Teflon-100X FEP boundary area is depressed to a comparatively even greater extent. In fact, at loadings above the 6-pound level, the performances of the Kel-F 500 and the Teflon-100X FEP jackets are similar.

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Many cables of this type are put into applications where they are expected to remain and give reliable service for very long periods of time, months or years, not merely hours. Furthermore, it is quite common for shielded and jacketed constructions to be installed in places where they will endure a considerable amount of mechanical abuse and be expected to withstand various random stresses and loads during service. The mere difference in physical size between a shielded and jacketed construction and a primary insulated wire may lead the unsuspecting technician to assume that the jacket is capable of withstanding greater abuse than primary insulation of the same type.

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It is essential that the comparative creep properties of these materials under compressive load be appreciated by the potential user. Because of such data Surprenant has been unwilling to recommend Teflon-100X FEP for unrestricted continuous use at temperatures above 200°C regardless of the fact that the material is known to resist thermal embrittlement in this temperature range for long periods of time. The proper continuous temperature rating for jackets of this material under conditions of appreciable compressive stress would be somewhere in the vicinity of 175 to 190°C, bearing in mind that "continuous" implies thousands of hours. Where long periods of time under loads, no matter how small, are necessary, it is highly advisable to be sure beforehand in a test rig that flow failures in service will not occur.

TABLE X

TEFLON-6 TFE AND TEFLON-100X FEP JACKETS: HEAT AGING-COLD BEND CYCLE

Specimens of various cables, shielded and jacketed as indicated, were aged in loose coil form in an oven maintained at a temperature of 250°C for a period of 96 hours. Following this, each was separately bent about a 3-diameter mandrel at room temperature for at least 6 complete turns, unbent, and examined for cracks. Next, the same specimens were conditioned for 18 hours at -65°C, and then while still at -65°C wrapped for at least 6 close turns about a 1-inch diameter mandrel. (Thus the severity of the cold bend varied slightly from specimen to specimen depending upon the actual o.d. of the specimen under test.) The specimens were removed from the cold chamber, returned to room temperature, and subjected to a careful visual examination. In all 16 cases, the jacket was visually intact. Next each was individually immersed in tap water for one hour, except for the ends. Following this, a 1.5 Kv rms potential was applied for 1 minute across the jacket, with the bath grounded. In cases where the jacket did not fail, the voltage was then raised at the rate of 500 V/second until failure occurred.

| Jacket | Cable Type | Overall o.d. (in.) | 1.5 Kv Shield-to-Ground, 1 Min. | Actual Breakdown Voltage |
|---|---|---|---|---|
| Teflon-100X FEP | Min. coax. | 0.131 | OK | 3.5 Kv |
| | " " | 0.105 | Failed | - |
| | " " | 0.125 | Failed | - |
| | 2- Conductor | 0.140 | OK | 3.0 Kv |
| | Min. Coax. | 0.132 | OK | 2.5 Kv |
| | 3- Conductor | 0.166 | Failed | - |
| | 2- Conductor | 0.126 | OK | 6.0 Kv |
| | 4- Conductor | 0.170 | Failed | - |
| | Coax. | 0.166 | OK | 5.0 Kv |
| Teflon-6 TFE Tape | Single Cir. | 0.105 | OK | 8.5 Kv |
| | " " | 0.093 | OK | 4 Kv |
| | " " | 0.090 | OK | 11 Kv |
| | " " | 0.122 | OK | 6 Kv |
| | 2- Conductor | 0.144 | OK | 4 Kv |
| | Min. Coax | 0.073 | OK | 10.5 Kv |
| | " " | 0.093 | OK | 6.5 Kv |
| | " " | 0.142 | OK | 7 Kv |
| | Single Cir. | 0.160 | OK | 10 Kv |

## Teflon-6 TFE and Teflon-100X FEP Jackets: Conditioning at Thermal Extremes

Comparative thermal degradation data among the three materials as jackets would naturally be expected to parallel that for the materials as primary insulations. However, here a comparison between the properties of Teflon-6 TFE and Teflon-100X FEP assumes increased importance, since the latter has frequently been recommended as an appropriate substitute for Teflon-6 TFE tape wrap. Temporarily, let us neglect the all-important property of flow at elevated temperatures. Table X compares the ability of specimens of 100X-FEP jacket and Teflon-6 TFE tape jackets to withstand heat aging at 250°C followed by a cold bend test at —65°C. This represents a degree of thermal abuse consistent with the temperature requirement for Teflon-6 TFE hook-up wire in MIL-W-16878C, Types E and EE. The test cycle was borne with success by the Teflon-6 TFE tape jacket, but it exceeded the capabilities of the 100X-FEP jacket in more than half of the determinations.

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Table XI gives performance information on 100X-FEP jackets subjected to three different cycling conditions, each less severe than that of Table X. Comparisons of

TABLE XI

100X-FEP JACKET: DIELECTRIC PROPERTIES FOLLOWING AGING AND BEND CYCLES

Previously untested specimens of shielded cables jacketed with Teflon-100X FEP were separately subjected to each of three conditioning cycles, all less severe than the cycle described in Table X.

1. Heat-aging: 96 hrs. @ 250°C in a loose coil, 3 X mandrel bend at room temperature, 1 hr. tap water soak, 1.5 Kv shield-to-ground for 1 minute, then voltage raised to failure.
2. Cold-bend: 14 hrs. @ -65°C, wrapped on a 1" diameter mandrel at -65°C, 1 hr. tap water, 1.5 Kv shield-to-ground for 1 minute, voltage then raised to failure.
3. Heat aging/cold-bend: 96 hrs. @ 200°C in a loose coil, 4 hrs. @ -55°C, wrapped on a 1" diameter mandrel at -55°C, 1 hr. tap water, 1.5 Kv shield-to-ground for 1 minute, voltage then raised to failure.

| Cable Type | Overall O.D. (Inches) | Cycle 1, Heat Aging (96 hrs. @ 250°C, 3X mandrel bend, dielectric test) | | Cycle 2, Cold Bend (-65°C, 1" Mandrel bend, dielectric test) | | Cycle 3, Heat Aging/Cold Bend (96 hrs. @ 200°C, -55°C, 1" mandrel bend, dielectric test) | |
|---|---|---|---|---|---|---|---|
| | | 1.5 Kv/1 Min. | BD Voltage | 1.5 Kv/1 Min. | BD Voltage | 1.5 Kv/1 Min. | BD Voltage |
| Min. coax. | 0.131 | OK | 5. Kv | OK | 11 Kv | OK | 2.6 Kv |
| Min. coax. | 0.105 | OK | 12.5 Kv | OK | 23 Kv | OK | 17 Kv. |
| Min. coax. | 0.125 | OK | 6. Kv | OK | 7 Kv | Fail @ 1.0 Kv | |
| 2-Conductor | 0.140 | OK | 4. Kv | OK | 13 Kv | OK | 8.5 Kv |
| Min. coax. | 0.140 | OK | 2. Kv | OK | 11 Kv | OK | 6 Kv |
| Min. coax. | 0.132 | OK | 8.5 Kv | OK | 13 Kv | OK | 8 Kv |
| 3-Conductor | 0.166 | OK | 8. Kv | OK | 20 Kv | OK | 7 Kv |
| 2-Conductor | 0.126 | OK | 12. Kv | OK | 21 Kv | OK | 17.5 Kv |
| 4-Conductor | 0.170 | OK | 6. Kv | OK | 9 Kv | OK | 10.5 Kv |
| Coax. | 0.166 | OK | 12.5 Kv | OK | 18 Kv | OK | 15.0 Kv |

results of these two tables show that Teflon-6 TFE tape-wrapped jackets appear able to withstand the four-day aging period at 250°C followed by a cold bend at —65°C. Teflon-100X FEP jackets are not consistently capable of withstanding this same heat cycle followed by a cold bend, although when the 250°C temperature is reduced to 200°C the performance appears satisfactory. However, before a Teflon-100X FEP jacket were employed in the 200° to 250°C temperature range for other than a very short time, it would be desirable to review the flow information above. Kel-F 500, of course, is useless as an insulating or jacketing material in this range, since it melts at just above 200°C.

## Resistance to MIL-H-3136 Fluid

**Also** interesting is the ability of these various materials to withstand immersion in solvents and organic liquids at elevated temperatures. With the great number of such liquids in current use, the entire range of temperatures to investigate, and the tremendous variety of applications into which such cables may be placed, it would be most difficult to initiate a test program which would take into account these many variables. However from previous experience, it has long been known that Kel-F 500 is softened by the effects of certain solvents at elevated temperatures, especially halogenated and cyclic materials. Table XII indicates comparative test data for jackets of Kel-F 500 and 100X-FEP exposed for a period of 30 days at temperatures of 70°C (158°F) and 127°C (281°F) while in contact with MIL-H-3136 Type III fuel. This fluid[6] consists of 30% toluene and 70% iso-octane and is similar to JP-4.

★ ★ ★

**From** the results shown in Table XII, it is obvious that even the 70°C aging cycle exceeds the capabilities of the Kel-F jacket, whereas the 100X-FEP jacket appears practically unimpaired after 30 days at 127°C in the test fluid Note, however, that the Kel-F 500 jacket did appear to remain undamaged following a 30 day room-temperature exposure. These data emphasize the necessity for evaluation in terms of expected application conditions whenever either of the melt-extruded jacketing materials is to be employed.

FIG. 5

TABLE XII

IMMERSION IN MIL-H-3136 TYPE III FLUID: KEL-F 500 AND TEFLON-100X FEP JACKETS

Samples of each of the two types of cables, some having the Kel-F jacket, some having the 100X-FEP jacket, were each wrapped individually on 1/2" diameter mandrels for 6 close turns. The ends of these specimens were stripped in such a manner that the shield was accessible on each end, and the ends were also restrained to prevent uncoiling of the specimens while under test. The Kel-F jacketed specimens conditioned at room temperature were merely placed in the test fluid with the stripped ends above the surface of the liquid and permitted to remain thus for the 30 day interval. The other specimens of both types of cable which were to be aged at elevated temperature were treated as follows: Each of the assemblies (mandrels with cables attached) were placed in a 1" diameter cylinder of copper tubing. One end of the tubing was hermetically sealed, the cylinder was filled with type III fluid, and then the other end was completely sealed also. The sealed cylinders containing the cables immersed in the test fluid were then placed in ovens at the appropriate temperatures for the 30-day interval. At the end of this time, the samples were removed from the cylinders, examined visually and given dielectric tests from shield to ground. On the first test, ground consisted of a metal foil wrapped securely around the jacket outer surface. Specimens which withstood this dry dielectric test were next immersed in a sodium chloride solution for two hours, and the dielectric test voltage was applied across the jacket while the samples were still immersed. Results were as indicated below:

| Jacket Type | Cable Immersed 30 Days (720 Hrs.) in Test Fluid @ | Visual Appearance On Removal From Chamber | Dielectric: Shield to Ground 1 Minute @ 2.0 Kv; Voltage then Raised to Failure | |
|---|---|---|---|---|
| | | | Dry (Foil Electrode) | Wet (0.5% Salt Solution) |
| Kel-F 500 | 20°C | Unchanged | Passed 2.0 Kv/1 min. | Passed 2.0 Kv/1 min. BD @ 10 Kv |
| Kel-F 500 | 70°C | Unchanged | Failed 2.0 Kv | - |
| Kel-F 500 | 127°C | Cracked, swelled & Softened | Failed 2.0 Kv | - |
| Teflon-100X FEP | 70°C | Unchanged | Passed 2.0 Kv/1 min. | Passed 2.0 Kv/1 min. BD @ 10.5 Kv |
| Teflon-100X FEP | 127°C | Unchanged | Passed 2.0 Kv/1 min. | Passed 2.0 Kv/1 min. BD @ 9.5 Kv |

## RFNA Resistance

**Another** material frequently required to be in contact with these various jackets is red fuming nitric acid (RFNA). This material which is used as a propellant in various reaction motor mechanisms is, of course, a powerful oxidizing agent and one of the more difficult liquids to contain and handle. Table XIII demonstrates the difference in performance characteristics of these three materials as jackets exposed to red fuming nitric acid for periods up to six days (148 hours). These results are important because they demonstrate the relatively low permeability of Kel-F 500 to RFNA. Although neither type of Teflon is chemically affected by the acid, both are comparatively permeable to it. For continuous service in an RFNA environment, neither TFE nor FEP provide nearly the protection of Kel-F 500. Data previously published[3] concerning 100X-FEP indicate that its tensile properties remain unchanged after a week's exposure to RFNA at 212°F, whereas the actual permeability to RFNA is appreciable.

## Application of 100X-FEP Over Tin Plating

A characteristic of Teflon-100X FEP which has received much publicity is the fact that it is suitable for application over tinned

TABLE XIII

EFFECTIVENESS AS A RED FUMING NITRIC ACID (RFNA) BARRIER: Te-6 TFE Tape, Kel-F 500, and Te-100X FEP Jacket

Equivalent samples of coaxial cable having the three different types of jacket indicated were immersed in red fuming nitric acid, sp. gr. 1.56, and removed for examination after each of the intervals indicated. The ends of the cables were led through suitable openings in the acid vessel lids and were well-sealed with paraffin to prevent vapors from coming in contact with them. Shields were all silver-plated copper. After the intervals indicated, a dielectric breakdown voltage was determined across the jacket from the shield to a grounded electrolyte solution. ("NC" indicates No Visible Change)

| Jacket Type:-- | | Te-6 TFE | Kel-F 500 | Te-100X FEP |
|---|---|---|---|---|
| Jacket Wall Thickness and Color | | 0.010" White | 0.010" Natural | 0.010" Green |
| Jacket Dielectric B.D. Voltage (prior to immersion) | | 10.0 Kv | 13.5 Kv | 10.5 Kv |
| Hours Immersed in RFNA | | | | |
| 24 | Jacket | NC | NC | Color faded slightly |
| | Shield | Slightly corroded | NC | NC |
| 48 | Jacket | NC | NC | Color faded slightly |
| | Shield | Corroded | NC | NC |
| 48 Jacket Dielectric BD Voltage | | — | 11.5 Kv | 9.5 Kv |
| 96 | Jacket | NC | NC | Color faded slightly |
| | Shield | Badly Corroded | NC | NC |
| 120 | Jacket | NC | NC | Color faded slightly |
| | Shield | Badly Corroded | NC | NC |
| 120 Jacket Dielectric BD Voltage | | 2.0 Kv | 8.5 Kv | 4.5 Kv |
| 148 | Jacket | NC | NC | Color definitely faded |
| | Shield | Very Badly Corroded | NC | Slightly Corroded |
| 140 Jacket Dielectric BD Voltage | | 2.5 Kv | 13.0 Kv | 6.5 Kv |

-35-

copper conductor, or as a jacket, over tinned copper shield. Teflon-6 TFE requires such high temperatures for sintering that the melting temperature of tin, 232°C (450°F), is exceeded during the actual Teflon-6 TFE fabricating process. Therefore, when attempts are made to apply a Teflon-6 insulation over tinned copper, the tin usually melts or softens, and the surface blackens due to the formation of oxide.

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It is quite true that 100X-FEP or Kel-F 500 can be successfully applied over tinned copper without melting the tin, and many constructions of this type have been prepared and tested. However, in the long run it is doubtful that much real advantage is thus gained. The slight reduction in costs is unimportant in view of the high cost of the insulating materials involved, and the tendency of tin to blacken and corrode at even moderately elevated temperatures is serious enough to discourage its use in most of these applications. Table XIV indicates the rapidity at which a tin-plated shield under a Teflon-100X FEP jacket darkens and discolors after exposure to elevated temperatures. This discoloration, where it does occur, is a serious problem for two reasons. First, any tendency away from a bright tin surface complicates the soldering problem considerably. Solder repairs on equipment exposed to high temperatures are greatly hampered. Most of these dark tarnish and oxide deposits can be removed only with the use of powerful acid or activated fluxes which are entirely inappropriate for use in electronic equipment. The other bad feature is that if the discoloration is allowed to progress, eventually all the tin may be consumed leaving unprotected copper, which has a very limited life at these elevated temperatures.

★ ★ ★

It has been found repeatedly that the darkening of tin plating occurs on exposure of tin plate to these elevated temperatures whether or not in the presence of one or the other of the fluorocarbon insulating materials.

TABLE XIV

TEFLON-100X FEP JACKET OVER TINNED COPPER SHIELD - THERMAL TARNISH EFFECT

Samples of multi-conductor cable having a tinned copper shield under a Teflon-100X FEP jacket were exposed for the indicated periods of time at the oven temperatures shown. Following each period, the shield was subjected to a visual examination and dipped into a pot of molten 60/40 lead/tin solder at 320°C. Observations of solder-adhesion were recorded. In three cases where serious discoloration occurred, a dielectric test was performed between shield and a grounded electrolyte bath according to the method of Table XI to determine whether shield discoloration had affected the dielectric properties of the jacket.

Key to Numerical Ratings:

0 - No visible change (Solders easily).
1 - Very slightly tarnished (Solders easily).
2 - Slightly tarnished (Solders with perceptible difficulty).
3 - Considerably discolored (Solders with considerable difficulty).
4 - Badly discolored (Solders only with powerful flux).

| Aging Period | 100°C | 127°C | 135°C | 150°C | 200°C | 250°C |
|---|---|---|---|---|---|---|
| 15 hrs. | - | | | 2 | 3 | 4 |
| 39 hrs. | - | | | 2 | 4 | 4: (OK 2 Kv/1 min. BD @ 10 Kv) |
| 69 hrs. | 0 | 2 | 3 | 3: (OK 2 Kv/1 min. BD @ 12 Kv) | 4: (OK 2 Kv/1 min. BD @ 8 Kv) | |
| 168 hrs. (7 days) | 1 | 3 | 4 | 4 | - | - |
| 336 hrs. (14 days) | 2 | 3 | 4 | - | - | - |
| 504 hrs. (21 days) | 2 | 4 | 4 | - | - | - |

**Reduction** in solder-wicking obtained with the use of tin plating in place of silver might assist in improving the flex-life of leads soldered into terminations. But nickel plating, which both minimizes wicking and effectively resists corrosion at elevated temperatures, seems a more profitable substitute for silver plating than tin. Teflon-6 TFE tape jackets are fully capable of satisfactory application over nickel-plated shields also.

## Abrasion Resistance—Jackets

**Table** XV indicates comparative abrasion-resistances among the three materials as jackets over shields. The test equipment was again set up as Figure 4, except

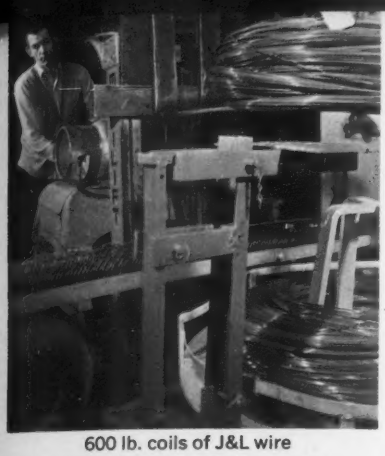
TABLE XV

JACKET ABRASION-RESISTANCE: TEFLON-100X FEP, TEFLON-6 TFE TAPE, AND KEL-F 500

Apparatus Used: MIL-T-5438 Abrasion Tester, 400 grit aluminum oxide cloth, marked with 1/4 inch wide silver paint stripes every three inches, "B" bracket, 1 pound loading-weight.

| Jacket Material: | Kel-F 500 | Teflon-100X | | Teflon-6 Tape | |
|---|---|---|---|---|---|
| Core Diameter Under Jacket: | 0.121" | 0.115" | 0.115" | 0.122" | 0.124" |
| Jacket Wall Thickness: | 0.006" | 0.008" | 0.010" | 0.008" | 0.010" |
| Readings (Inches of Tape Travel): | 24 | 24 | 36 | 21 | 33 |
| | 27 | 18 | 30 | 21 | 39 |
| | 21 | 21 | 39 | 18 | 51 |
| | 24 | 27 | 30 | 18 | 39 |
| | 27 | 18 | 27 | 15 | 36 |
| | 24 | 21 | 30 | 18 | 45 |
| | 21 | 27 | 33 | 16 | 39 |
| | 24 | 24 | 30 | 15 | 42 |
| Average of All Readings Less Than Numerical Average: | 23" | 19.5" | 29.4" | 15" | 37.2" |

Springs for the famous Sealy Posturepedic mattress, one of the 100 different mattress constructions made by Sealy, from J&L Mastercraft spring wire.



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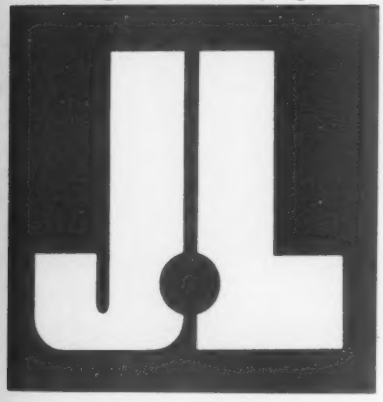

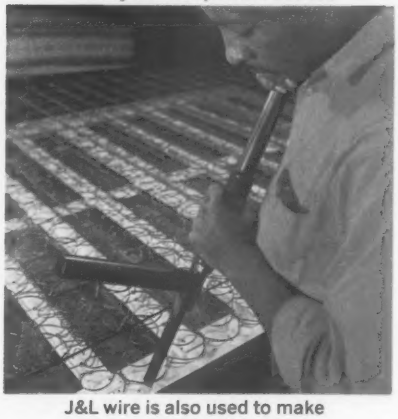

J&L wire is also used to make Sealy box spring units . . .

. . . and box springs and mattresses for sofa beds

# "We can make mattress coils almost twice as fast with J&L spring wire"

*. . . reports Sealy Mattress Company of Cleveland, Ohio*

"Profitable mattress-making operations require high-speed production of spring coils—and *every* coil must meet established specs," says Larry Higgins, plant engineer of Cleveland's Sealy Mattress Company. "Using J&L spring wire, we can run our automatic coilers at rates well above normal maximums; and the constant adjustment and readjustment of coilers has been eliminated. A single operator can now handle two or more machines instead of just one. In addition, the consistent quality of J&L wire has permitted us to switch from the standard 150 lb. coil to special 600 lb. coils for longer production runs and less down time. And we don't have to reset our machines for each new coil."

**Jones & Laughlin Steel Corporation**

PITTSBURGH, PENNSYLVANIA

that here the cable shield was grounded so that jacket failures could be detected. As in the primary abrasion-resistance comparison of Table VII, the differences were still not large, although with the Teflon-6 TFE in the form of wrapped tape, it displayed poorer abrasion resistance than equal walls of either of the other two materials. Differences in abrasion resistance caused by differences in wall thickness of a given material appear to be of a greater magnitude than that caused by the substitution of equal wall-thickness jackets of either of the other two materials. Teflon-100X FEP and Kel-F 500 seem approximately equivalent to each other in jacket abrasion-resistance. (The sample of Teflon-6 TFE tape jacket of 0.008" thickness was prepared especially for this investigation and represents a thinner tape jacket wall than would normally be practical for general use. The 0.010" wall thickness of Teflon-6 TFE tape is more useful from the physical strength point of view.)

## Summary

**The** pros and cons of each of the three fluorocarbons as primary insulations and jackets are summarized in Table XVI. Obviously, no two of the resins are identical; each has its limitations, each its place. High-temperature resistance in its broadest sense is the one property which unmistakably distinguishes the materials from each other. The reported differences in other characteristics may, of course, be critical in certain applications, but these differences do not compare in either magnitude or importance with those related to the thermal and flow properties.

★ ★ ★

**As** primary insulation, extruded Teflon-6 TFE is indeed unique, with its great resistance to flow at elevated temperature and resistance to thermal embrittlement. These set it entirely above and apart from 100X-FEP or Kel-F 500 in the realm of reliability. In flexibility and abrasion-resistance all three materials are roughly equivalent, although the Teflon-6 TFE insulated wire displays some flex-life advantage. As a jacketing material, fused Teflon-6 TFE tape displays the greatest resistance to flow under load at high temperatures. It may also withstand more rigorous heat-cold cycles than the Teflon-100X FEP. However, in the great majority of cases, the combined problems of liquid or vapor diffusion, space and bulk reduction, and providing some degree of physical ruggedness to occur. Here Teflon-100X FEP, with its smooth extruded surface seems the obvious best choice for jackets.

★ ★ ★

**Kel-F 500** has perhaps been shown to be the least versatile of the three, but its resistance to solvents and elevated temperatures is still good. In fact, it is considerably greater than that of practically any other non-flammable wire insulation, aside from the Teflon group members. Thus, if its use is confined to places where elevated temperature and solvent resistance are not simultaneously required, it should continue to be useful and find worthwhile new applications.

★ ★ ★

**The** fluorocarbon resins as a group have so many properties which make them valuable as wire and cable insulations that their present popularity in these fields is readily understood, even with their relatively high initial cost. Still further dependence on these materials is foreseen as applications become more demanding, service temperatures push higher, contact with reactive materials increases, and universal reliability becomes the ultimate criterion on which all circuitry is judged. Indeed, in future years, the fluoro-

(*Please turn to page* 500)

TABLE XVI

THE PROS AND CONS OF TEFLON-6 TFE, TEFLON-100X FEP, AND KEL-F 500: A SUMMARY

| | Relative Advantages | Relative Disadvantages |
|---|---|---|
| **Primary Insulation** | | |
| Teflon-6 TFE | Unmatched reliability in contact with solder irons.<br>Maximum resistance to thermal embrittlement.<br>Readily available. | Some length limitation. |
| Teflon-100X FEP | Lengths theoretically unlimited.<br>Good resistance to thermal embrittlement. | Poor resistance to flow at elevated temperature.<br>Limited solder-iron resistance.<br>Limited supply. |
| Kel-F 500 | Readily available.<br>Lengths theoretically unlimited. | Poor resistance to flow at elevated temperature.<br>Poor solvent resistance at elevated temperature.<br>Usage limited to temperature below 175°C. |
| **Cable Jacketing** | | |
| Teflon-6 TFE | Maximum resistance to thermal embrittlement.<br>Maximum flow-resistance at elevated temperatures.<br>Solder iron resistance.<br>Readily available.<br>Excellent solvent resistance over entire useful temperature range. | Uneven outer surface.<br>High RFNA permeability.<br>Possibility of porosity.<br>Some length limitation.<br>Minimum practical wall thickness, sometimes heavier than desired; increased bulk, reduced flexibility. |
| Teflon-100X FEP | Excellent resistance to thermal embrittlement.<br>Excellent solvent resistance at elevated temperatures.<br>Smooth outer surface.<br>Theoretically unlimited lengths.<br>Thinner walls practical than with TFE - reduced bulk and weight, improved flexibility. | Limited supply.<br>Appreciable RFNA permeability.<br>Limited solder-iron resistance. |
| Kel-F 500 | Smooth outer surface.<br>Lengths theoretically unlimited.<br>Very low RFNA permeability.<br>Ready availability. | Poor solvent resistance at elevated temperatures.<br>Usage limited to 150° - 175° maximum due to flow at elevated temperature.<br>Poor solder iron resistance. |

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Point Breeze Works
Baltimore, Maryland

**This article describes a system developed by the author's company to cool and clarify wet type wire drawing compounds to draw wire more efficiently.**

A wire drawing machine is like an iceberg—the larger part of it is unseen — usually beneath the surface of the floor, or hidden away in a basement, for every modern high speed wire drawing machine requires a compound system, without which the machine itself is useless. The compound performs three very necessary functions: It lubricates the dies, capstans, and the wire being drawn—it acts as a coolant, carrying off the heat developed during the drawing operation and transferring it to heat exchangers; and it carries off the copper particles which are abraded by the dies, allowing them to settle as a sludge on the bottom of the settling tanks.

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**In** the recent expansion of the wire drawing facilities at Western Electric's Point Breeze Plant in Baltimore, it was necessary to install a completely new compound system, since the wire drawing area was moved from one end of the cable shop to the other end and it was not feasible to move the underground tanks. Thus an opportunity was afforded to correct the deficiencies which had become apparent during fifteen years of operation of the old system, as well as to plan a more flexible system for future use. Many limiting factors and considerations precluded an easy solution to the problem. The system which was finally chosen has provided reliable operation with a minimum of manual labor, and represents an appreciable improvement in working conditions and cleanliness.

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**Wire** drawing compounds for copper are usually water emulsions of fat (beef tallow) soap and a vegetable oil. Some proprietary compounds employ additives such as anti-bacterial agents to provide stability, and chelating or sequestering agents to retard formation of insoluble copper soaps. The compound used at Point Breeze is purchased under Western Electric specification and contains fat, soap and rape seed oil. This is received from the supplier as a light-colored paste which must be mixed with hot water, diluted, and distributed to the operating tanks.

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**In** the early days of wire drawing, all of the compound was contained within the wire drawing machine, with the bottom of the capstans dipping into the bath, which led to the use of the word "dip" for compound. The practice has persisted, and even today, in many wire mills the compound is referred to as "dip." One modern machine of German manufacture contains all of the compound within the base of the machine, and in use, the wire, the capstans, and the dies are all completely immersed in the compound. At certain speeds this may be an ideal arrangement, but when one considers the amount of heat developed in drawing 5/16" rod to 14 gage at 6300 feet per minute, or in drawing 14 gage to 19-26 gage at 10,000 feet per minute, as Western Electric high speed machines do, it becomes obvious that a greater volume of coolant is required than can be contained within the machine.

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**The** problem then, becomes that of providing a continuous source of clean compound to the machines, cooled to a predetermined temperature. This is accomplished by allowing the compound to flow from the machine to one end of a settling tank where the minute copper particles are allowed to settle out as the compound moves slowly toward the exit end of the tank. At the exit end, the compound is pumped through a heat exchanger to reduce the temperature to the correct operating range, and then to the wire drawing machine to continue the cycle. Although this may appear to be a relatively simple problem, it is complicated by the fact that in addition to performing these basic functions, the following features were regarded as being either necessary or highly desirable:

1. **The system should permit either continuous or quick and convenient periodic removal of copper sludge.**
2. **It should be readily adaptable to various types of coolants.**
3. **It should permit operation of individual machines with experimental compounds.**

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**The** possibility of removing copper sludge continuously while the tank is in operation has great appeal from an operating point of view, since it eliminates the necessity of shutting down the operation to get rid of the accumulated sludge. However, due mainly to cost considerations, continuous sludge removal is most practical on installations using a central compound system for all machines of a given type. For reasons that will be discussed later, the single central system was considered to be less desirable for the Point Breeze installation.

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**Considerable** time and effort was

expended on finding means for improving on the traditionally dirty, difficult, and hazardous job of cleaning out wire drawing compound tanks. The previous method required pumping out the liquid down to the sludge level and then removing the sludge by having operators in hip boots enter the tank and bucket the sludge into 55 gallon drums lowered into the tank on a hoist. Residual sludge was removed by shovels and scrapers. The sludge somewhat resembles mud, except that it is brownish-copper colored and is characterized by extreme slipperiness from the fat, soap and oil that coats each metallic particle. The heat and humidity in the tank, plus the constant hazard of losing one's footing constitute extremely disagreeable working conditions. The chosen design represents a major improvement in the method of carrying out this operation.

* * *

**The** second desirable characteristic—that the system should be readily adaptable to various types of coolants, was dictated by the requirement that the wire drawing shop be readily convertible in whole or in part to the manufacture of aluminum conductor. Aluminum is usually drawn with a coolant having a mineral oil base and a saponifiable fat additive. Experience at the Western Electric Company's Kearny, New Jersey Works has proven that the fat-water emulsion type of compound used for copper can also be used in drawing aluminum from 13 gage to intermediate sizes, but that for the drawing of rod the mineral oil type of compound is required for Western's cone capstan machines.

* * *

**By** providing a separate compound system for each No. 1 wire drawing (rod breakdown) machine and arranging the No. 2 (intermediate) machines in groups of two per tank, with the exception of two which are on individual tanks, the utmost in flexibility has been achieved. Conversion to the manufacture of aluminum conductor can be accomplished on the basis of any number of No. 1 machines and the associated number of No. 2 machines.

**If** possible, a compound system should be designed in such a manner that one machine representative of each group may be operated completely independently of other machines. Only by such isolation can one study the effects of such factors as: The relative performance of compounds from various suppliers; the effects of particle size, temperature, or age of compound; the rate of compound flow and the rate of sludge settling; and many other factors which can have a great influence not only on the quality and finish of the wire, but also on the rate of wear of the dies and capstans, all of which affect the economy of the operation. Also, new compounds or new ingredients may be investigated and evaluated with minimum effect upon the overall operation.

* * *

**After** deciding upon the features which we wanted to incorporate into our new system, we took stock of the limiting factors which were inherent in the Point Breeze installation and which might have an influence upon the final design. Since we were using an existing building, and space was definitely limited, a location beneath the floor level was indicated. However, the cable shop building has no basement, and in fact, the ground level is only 12 feet above sea level, which would make any extensive excavation a costly procedure. A design was chosen which kept excavation and the need for floor reinforcement to a minimum. All tanks are arranged in two rows, one on either side of a six foot wide tunnel which runs the length of the wire drawing area, approximately 210 feet. All of the tanks and the tunnel are of reinforced concrete unit construction, with glazed tile walls in the mixing room, for ease of cleaning, and non-skid paving bricks on the floor of both the mixing room and the tunnel to provide safe footing.

* * *

**Another** factor which influenced the design of the system was management's decision to insure strict conformance with Baltimore City's anti-pollution ordinances by completely isolating the compound system from any connection with the sewer system. For emergency purposes, floor drains in the tunnel and mixing room lead to a sump which is pumped to a sewer. These drains are necessary to handle emergency flooding conditions and in routine cleaning of the floors.

* * *

**Liquid** wire drawing compound is not discarded when cleaning tanks, but is simply pumped to an adjacent tank or tanks down to the sludge level and then the sludge is removed and disposed of. The tanks are designed to operate at a normal level of 25-30 inches (approximately 2000 to 2500 gallons), but can accommodate up to 74" to implement the cleanout procedure. Obviously, a considerable saving in the cost of compound is realized.

* * *

As an aid in visualizing the tank and tunnel arrangement, Fig. 1

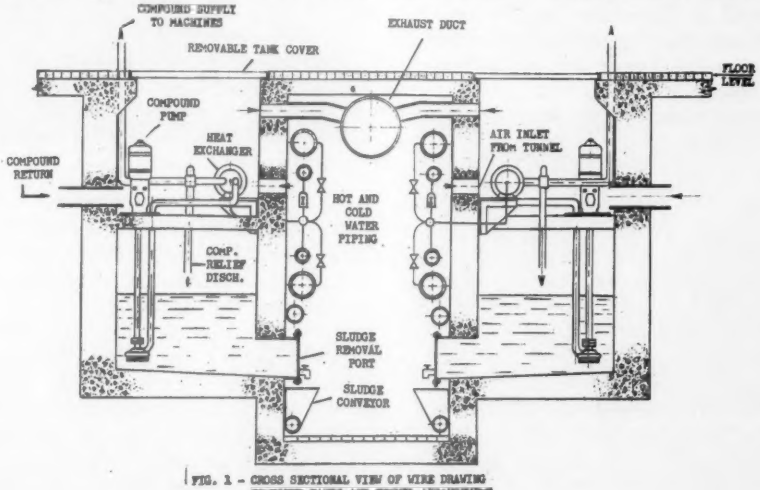


FIG. 1 - CROSS SECTIONAL VIEW OF WIRE DRAWING COMPOUND TANKS AND TUNNEL ARRANGEMENT

shows a cross-sectional view through two typical tanks. Each tank is 5 feet wide and 20 feet long. The size was chosen to provide a 16-20 minute settling time, which was considered to be optimum. In order to provide maximum interchangeability, the pumps for both types of machine are identical. The chosen pumps are 150 GPM centrifugal type and serve either one No. 1 machine or two No. 2 machines. Since there is no basement as such, the space required by the heat exchangers and pumps at first posed a bit of a problem. Vertical pumps could have been mounted in a conventional manner, with the motors above the first floor level, but this would have seriously impeded operations. Consultation with pump and motor suppliers revealed that we could obtain pumps which would perform reliably under the conditions of high temperature and humidity that would be encountered within the tanks. This has permitted the installation of pumps, heat exchangers, relief valves, and associated piping within the tanks, not only saving space but confining within the tank itself the major source of compound leaks with its attendant housekeeping difficulties. Easy access to the tanks for maintenance purposes is provided by a four foot by fifteen foot opening in the top of each tank. Cover plates surfaced with wood block flooring set flush with the floor cover these openings when not in use. Electrically operated monorail hoists installed centrally over each line of tank permit easy removal of the cover plates and facilitate the removal of pumps and heat exchangers for maintenance purposes.

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**Wire** drawing compounds should be maintained between certain maximum and minimum temperatures, whether the machines are running or idle. Excessively high temperatures will result in both chemical and physical degradation of the fat particles. At the higher temperatures the fatty esters are less stable and split out free fatty acid, with an accompanying reduction in lubricating efficiency. At these temperatures also, the emulsifying agents (such as sodium stearate) which coat each fat particle are more soluble in water, and allow the fat to coalesce or agglomerate. Too low temperatures will also cause an increase in particle size, resulting in "plating out" of fat on machines and heat exchangers.

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**In** order to insure that the compound will be maintained within the optimum temperature range, a fully automatic heating and cooling system was installed which provides hot water heating through the heat exchangers should the compound temperature drop below 100°F. Between 100 and 120° neither heating nor cooling is supplied. At 121° partial cooling is supplied, and at 123° full cooling is supplied. These operations are performed automatically by means of temperature sensing and controlling devices and electric-hydraulic motor operated valves. Obviously, such complete control of compound temperature on a multiplicity of tanks requires considerable piping and valving. All of the control piping is located along the walls of the tunnel and is readily accessible for maintenance. Fig. 2 shows a view of the tunnel looking toward the row of No. 2 tanks.

Fig. 2—Tunnel arrangement

**The** sludge removal equipment consists mainly of two 4 inch diameter tubular chain type conveyors, one serving the five No. 1 tanks and the other the 10 No. 2 tanks. The one serving the No. 2 side is longer, running the complete length of the tunnel (210 feet). Both conveyors elevate the sludge at a 60° angle at the discharge end to raise it to a height of about 12 feet above the first floor where it is discharged through chutes into 55 gallon drums for disposal. The conveying element is composed of a series of links and discs, the discs being a neoprene and steel sandwich having a diameter which will convey the material but still allow free sliding fit of the baffles in the tubes. The discs are spaced about six inches apart. The loading portion of the conveyor consists of troughs into which the sludge is raked, running the length of each tank as will be noted in Fig. 3, which shows the operator performing the sludge removal operation.

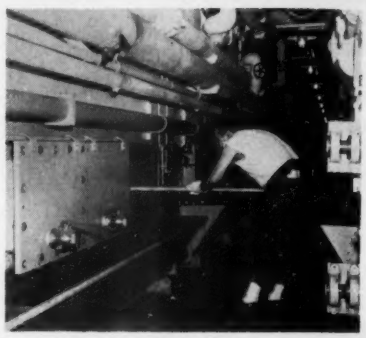

Fig. 3—Removal of sludge

**The** upper portion of the chain is exposed as it travels through the trough carrying the sludge with it into the tubing portion of the conveyor. Since the troughs are arranged in a row, sludge may have to be carried into and out of several troughs successively before it reaches the elevating section of the conveyor. However, this has not proved disadvantageous, and there is practically no build-up of sludge in subsequent troughs. The condition of the sludge presents no difficulty to the conveyor, which will transport either liquid, soupy, or solid material with equal ease. Although the manufacturer of this equipment, knows of no other similar installation, the slippery nature of the sludge makes it almost ideally suited to handling by this means.

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**Access** to the tanks from the tunnel is by means of four 15 x 24 inch openings in the side, the bottom edges of which are level with the tank bottom. Each port is equipped with a steel cover which

(*Please turn to page* 496)

# New Cellulosic Plastic Finish Improves Life And Finish of Fabricated Wire Products

by Walter R. Pascoe
Technical Service Manager
National Polymer Products, Inc.
Subsidiary of The Polymer Corporation
Reading, Pennsylvania

**In this article the author describes a new plastic material for products and its method of application.**

**Fabricated** wire products are now being clad successfully with cellulosic plastic finishes which offer new advantages of durability and appearance.

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**Parts** to be clad are preheated and dipped into a fluidized bed of dry "Corvel" finishing powders. No solvents are required. The powders are in a state of "whirling suspension" and assume penetrating flow characteristics much like a liquid.

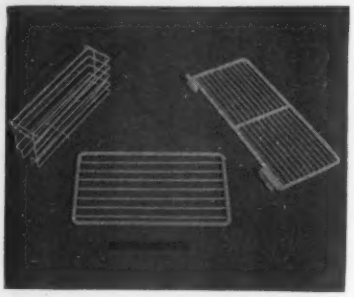

Fig. 1—Wire products finished with Corvel. * *

**These** cellulosic powders, of special formulation, bond by fusion to the surface of the metal. They are applied in a new fluidized coating process patented and available under license in the United States.

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**The** cellulosic claddings produced in one dip vary from 8 to 30 mils thick, which is considerably heavier than any finish obtainable with conventional lacquers or solution finishes.

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**Steel** wire, welded tinned wire, and welded copper plated wire have all been coated to advantage with cellulosic fusion bond finishes. Wire stands, racks and other configurations retain a heavy finish with excellent coverage of all projections, corners, edges, joints and contact points. This type of cladding is of uniform thickness, unmarred by sags, drips, bridging or irregularity in material flow, even thoroughly covering the contours on complex shapes.

Fig. 2—Serving cart with durable, attractive cellulosic coating. * * * * * * * * * * *

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**Better Bilt Products, Inc.,** Addison, Illinois, is applying the new finish to its line of ornamental wire accessories for the house and garden. Included are such wire products as: serving carts, planters, tier carts, portable fence panels, trellises, ornamental borders for lawns and flowerbeds, plant guards, flower display stands and window-wall shelves.

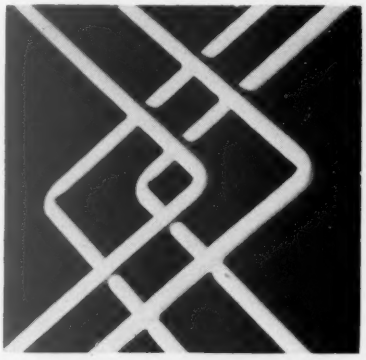


Fig. 3—All joints and contours are covered uniformly without overlap of the coating. * * * *

**Independent** tests on products with cellulosic claddings have shown the finish to be unaffected by long exposure to severe heat and cold, salt spray and abrasion. After 1000 hours continuous exposure to salt spray, it was impossible to distinguish between the tested and untested samples.

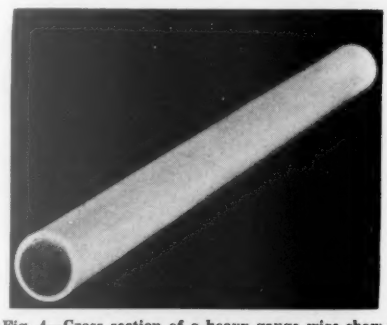
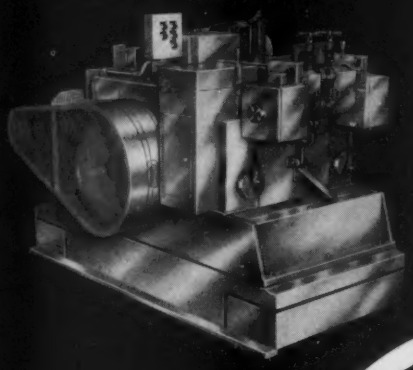
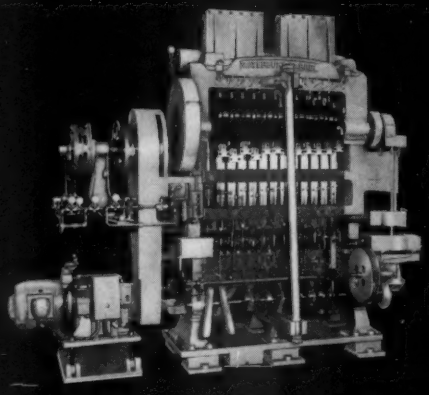


Fig. 4—Cross section of a heavy gauge wire showing the thick (0.050") cellulosic coating that has been applied. * * * * * * * * * * * * * *

(*Please turn to page* 498)

COLD HEADING
MACHINERY

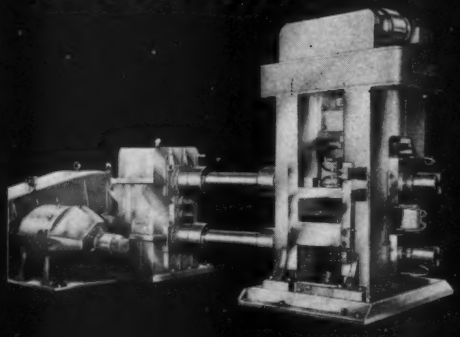


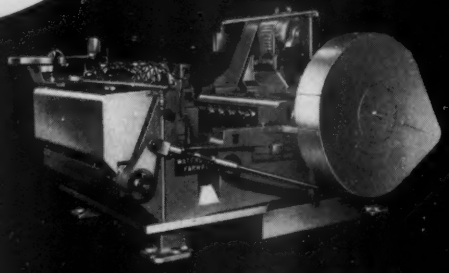


EYELET, SLITTER
& WIRE
MACHINERY

WATERBURY
MACHINERY BUILDERS
FARREL

ROLLING MILL
MACHINERY





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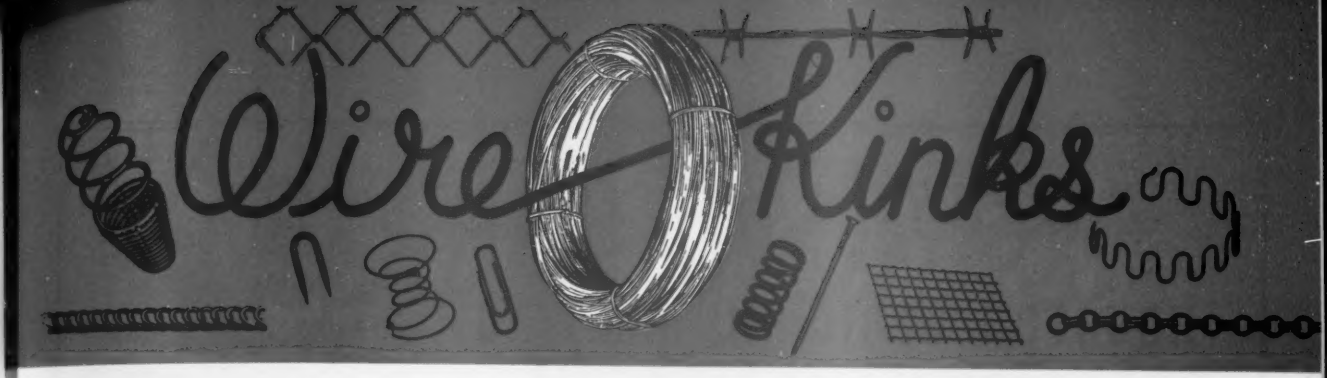


## To Prevent "Ladder Slip," Do This

**Many** an accident has been caused by the slipping of the foot of a ladder. This is particularly true when the ladders are used on slippery floors.

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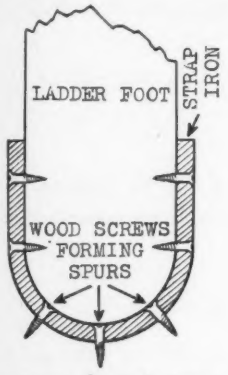
**There** are various ways in which this danger can be prevented—methods for holding the ladder base rigid. A simple and excellent method, shown in the sketch, can be made by any ladder user. A piece of strap iron is formed around the bottom ends of the ladder with holes countersunk for screws, as indicated. The screws which project outward through the strap iron hold the ladder in place while those that project inward hold the straps on the ladder feet.



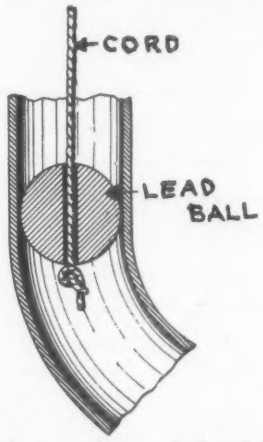

**To** be sure, do not use a ladder of this kind directly on a polished or other floor that must not be marred. Place it on a non-slip plank or old wooden board. But make certain, above all, that there will be no slip of the base of the ladder or plank or board on which it is resting.

## How To Pull Wire, Rope, Etc., Through Tubes or Pipes

**A** practical best scheme for pulling rope, wire, chains, etc., through

**Do you have how-to-do-it items for this department? To make it a success we are depending on readers to send us material drawn from their own experience and observation. Your cooperation will be appreciated by us and our many readers.**

fixtures, pipe, etc., is to start a small thread or cord through the opening attached to a lead ball, as shown in the accompanying sketch.




The hole is easily made by drilling, or, if sufficient care is exercised, a steel needle can be driven through a coin by using a cork. Make the knot small enough so that the cord won't catch ahead of the lead ball. After the first cord is pulled through, the remainder of the operation is easy. Keep the lead ball in your kit for possible future use.

## Selecting The Right Grade of Bolt

**With** few exceptions, the true function of a bolt is to clamp members together, and not to act as an axle or fulcrum. The residual tension set up in the bolt keeps joints tight.

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**There's** rarely need for costly alloy steel fasteners—not when 3 physical grades of steel can satisfy most "clamping" applications.

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**SAE** grade 1 offers 55,000 psi minimum tensile strength; grade 2, 68,000 psi; and grade 5, approx. 120,000 psi.

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**The** first is used for fasteners which are stress-relief annealed to increase ductility. The next provides low carbon fasteners with a bright finish. The last goes into high-carbon, heat treated black fasteners identifiable by three radial dashes on the head.

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**In** terms of holding power, the stronger bolts and cap screws can cost you less than the cheaper bright ones. For example, either a $\frac{5}{8}$" with three radial dashes or a $\frac{3}{4}$" bright cap screw can be used for a safe working load of 20,000 pounds. But being smaller, the high strength one costs less. However, if the same diameter is desirable, then fewer bolt holes need be made and faster assembly achieved when a product is designed to make use of high strength bolts.

★ ★ ★

**In** short, for more pounds of clamping effort per dollar, use high strength fasteners; for more pieces per dollar, use the lesser grades.

*—Courtesy of Russell, Burdsall & Ward Bolt & Nut Co.*

## How To Avoid A Common Transmission Error

The Thing To Do is to "Balance" the Drive if You Can, or, Use an Outboard Bearing.

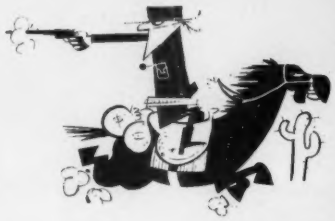
**Here** is a sketch, Fig. 1, that shows an error in arrangement of pulleys and belts that is commonly made. The larger pulley is the

# PREPARE YOURSELF

## FOR THE

# HOUSTON REGIONAL MEETING

## AND A GOOD TIME!



## MAY 7-8, 1959 • SHAMROCK HOTEL • HOUSTON, TEXAS

**At this time and at this place Steel Wire Men can be assured of a good technical program and Texas hospitality.**

## *The Program*

**THURSDAY, MAY 7th**

**9:00 A.M.—Registration**

**12:00 Noon—Luncheon for Program Participants**

**2:00 P.M.—Technical Session**

***Chairman of Meeting***

**T. B. DULL, Superintendent of Wire Mills, Sheffield Div., Armco Steel Corp., Kansas City, Mo.**

PAPER: "Developments in the Production of Bolt and Nut and Forged Products" by R. C. RHOADES, Works Mgr., Sheffield Div., Armco Steel Corp., Kansas City, Mo.

PAPER: "Use of Pressure Dies for Better Lubrication in the Drawing of Steel Wire" by EARL A. BOWERS, Vice Pres., Standard Industrial Compounds Co., Frankfort, Ill.

PAPER: "The Production of Stainless Steel Wire" by GILBERT C. KLINGEL, Mill Representative, Baltimore Works, Armco Steel Corp., Baltimore, Md.

PAPER: "The Production of High Carbon Steel Wire" by STEWART S. GRAY, Asst. Vice Pres., Union Wire Rope Corp., Kansas City, Mo.

**6:30-7:30 P.M.—Cocktail Hour—Courtesy of a number of companies.**

**7:30 P.M.—Dinner. Ladies invited to attend. After dinner the gathering will be addressed by MORRIS FRANK, a Texan who has achieved a national reputation as an outstanding speaker.**

**FRIDAY, MAY 8th**

**9:00 A.M.—Plant Tour: Wire mill of Sheffield Div., Armco Steel Corp. at Houston.**

**1:00 P.M.—Texas Barbecue at the Texaco Country Club.**

***For the Ladies:* A tour of interesting points about the city has been arranged.**

All steel wire men, from every corner of the country, will find this Regional Meeting rewarding and very much worth while. William L. Dull, Superintendent of Wire Mills at Houston, as Chairman of the Program Committee, extends a cordial invitation to all to attend.

***Make your plans now to go to Houston***

## THE WIRE ASSOCIATION

**RICHARD E. BROWN, *Executive Secretary***

**453 MAIN STREET • STAMFORD, CONN.**

# Wire Kinks

standard pulley on an electric motor or on an engine. Let us say for convenience that it is on a motor and that the motor is under loaded. Somebody sees an opportunity to increase the load, so the smaller pulley is added. That is, two pulleys are placed side by side on the same overhanging shaft and both belts pull against the bearing in the same direction. The total pull against the bearing as indicated by the figures amounts to 100 plus 100 plus 400 plus 400 or, 1000 pounds.

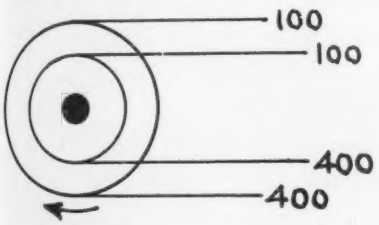


Fig. I

**Inasmuch** as motor bearings are designed for a definite bending force, this is obviously not good engineering practice. All bearings have their limitations, of course, if the two belts leave the pulleys in the same direction as shown in Fig. 1, the design is wrong because the chances are that the bearing will not be able to withstand the combined leverage or bending moments. The outside pulley, being farther away, causes the bending stress to be greater in the bearing than that due to an equal pull on the inner pulley.

Fig. II

**The** correct method of balancing is shown in Fig. 2. By so arranging the drives that the belts will leave in "opposite" directions, the bending stress will be less than would be the case with a single pulley and with the motor pulley fully loaded. Such a condition is all right. Here we have 500 pounds acting in one direction which is exactly balanced by 500 pounds acting the other way. (400 plus 100) (100 plus 400) equals zero. The belt at the left, Fig. 2, is a top pull belt, true, but that is better than ruining the motor for the sake of two under-pull belts.

★ ★ ★

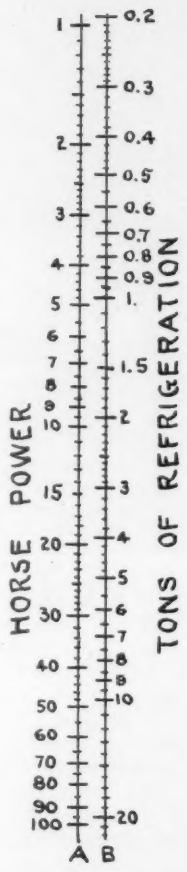
**Further,** a point to bear in mind is this:—overhung pulleys on electric motors or engines should always be operated as close to the bearing as possible. If you MUST run belts as shown in Fig. 1 or if you MUST place the pulley at a considerable distance from the motor bearing, use an additional outboard bearing. The outboard bearing will soon pay for itself in the saving of shafts, bearings, and power.

## This Chart Compares Refrigeration and Horse Power

**Although** refrigeration and air conditioning are rapidly becoming commonplace, have you ever seen a chart showing the relationship between refrigeration and horse power? We never have, but have often felt the need for one for checking values commonly encountered. As a result, this chart has been developed.

★ ★ ★

**The** chart is based on theoretical values. A ton of ice represents 288,000 Btu. And since one Btu is equal to 778 foot-pounds, and there are 33,000 foot-pounds in a horse power per minute, it is evident that




the theoretical relationship can be readily determined. Thus the chart shows that one h.p. is equivalent to 0.21 tons of refrigeration. Or, 10 h.p. is equivalent to 2.1 tons. In other words with an overall refrigerating machine efficiency of 100 per cent a 10 h.p. motor would produce 2.1 tons of ice in 24 hours. A 100 h.p. motor would produce 21 tons of ice in 24 hours. And so on.

★ ★ ★

**For** example if you should want to know the theoretical equivalent of, say 6 tons of refrigeration, you use the chart in this way: Find the

(*Please turn to page* 510)

# ANNOUNCING the WYREPAK

## FEATURES

1. TURNTABLES COMPLETELY ENCLOSED.
2. BALL JOINT MOUNTED GUIDE SHEAVES FOR ALL ANGULAR SETTINGS.
3. ELECTRO-MECHANICAL TENSION CONTROL FOR EACH HEAD.
4. PRECISION GROUND PRESSURE ROLLS.
5. PRIME RUBBER LAGGED CAPSTAN.
6. ASSEMBLED AND ALL ADJUSTMENTS MADE WITH ALLEN SCREWS.
7. ALUMINUM CAPSTANS, WITH HARD-ANODIZED, POLISHED RUNNING SURFACES.
8. INDIVIDUAL MAINTENANCE ON EACH SECTION.

The drum packaging Take-Up System illustrated, Model S5-TC-S, was designed especially for Magnet Wire.

Other models are made for all types of ferrous and non-ferrous wires.

Advanced engineering and precision construction have evolved in this machine new concepts of speed and efficiency in the packaging of wire. Capacity: Min. size — #32 ga.; max. size — #20 ga. wire.

**YOU ARE INVITED TO SECURE COMPLETE DETAILS REGARDING THIS ADVANCED PROCESS FROM —**

## Advanced Wyrepak Co., Inc.

11 HARRISON COURT PHONE: EDison 4-4274 BRIDGEPORT, CONN.

OR The Vaughn Machinery Co., CUYAHOGA FALLS, OHIO

# Torsional Strength of Small-Diameter Wire

**Fundamental to the operation of many ordnance items such as machine guns and proximity fuses are the wire springs that control detonation. To improve the performance and reliability of the springs used in these devices, the National Bureau of Standards has been conducting metallurgical research for the Army Ordnance Corps. In a recent study of the torsional fatigue properties of springs and straight-wire specimens, reversed torsion tests were used to simulate the actual stresses that springs undergo in service. Experimental results indicate that these tests afford an excellent criterion of the fatigue strength of small-diameter spring wire.**

**The** National Bureau of Standards has completed an investigation of the torsional fatigue properties of small-diameter, high-carbon steel wire for the Springfield Armory, Army Ordnance Corps. The work constitutes one phase of continuing research to improve the performance and reliability of springs used in ordnance devices. Data derived from tests made on springs and reversed torsion tests on straight-wire specimens showed close agreement. From the experimental results, it appears that the behavior of small-diameter spring wire can be more realistically determined from torsion tests than from the conventional tensile tests now used as a criterion.[1]

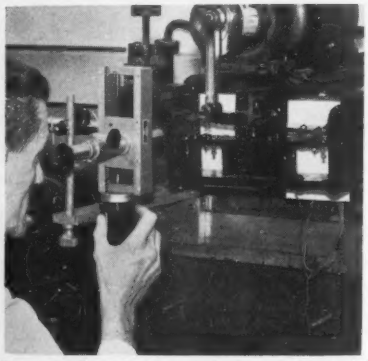


Figure 1.—Several wire springs can be tested simultaneously in this testing machine at the National Bureau of Standards. Here a cathetometer is used to measure the coil deflection of one of the springs in position for testing between 2 steel plates on the machine. * * * *

**Specifications** for small-diameter spring wire are usually based on tensile strength. However, previous work[2] had indicated that tensile strength is not an adequate measure of the expected performance of wire when it is coiled in helical extension or compression springs. The present study was undertaken to determine the metallurgical factors that influence the resistance of wire to fluctuating loads, and to devise a satisfactory method of evaluating this resistance. Also, since little published information is available on the effects of shot peening on the mechanical properties of springs, this factor was evaluated during the investigation.

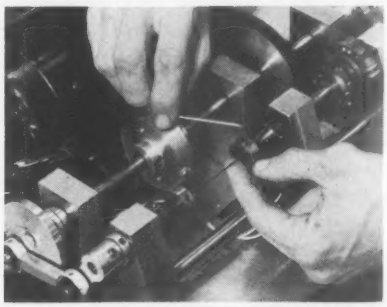


Figure 2.—Testing machine developed at NBS for performing reversed torsion tests on small-diameter spring wire. A 3-in. long specimen is fastened between 2 grip heads that oscillate individually when the machine is in operation. *

**H. C. Burnett** of the Bureau's mechanical metallurgy laboratory conducted the present study on three different types of wire: a cold-drawn music wire, an oil-tempered music wire, and a wire fabricated from a special heat of vacuum-melted steel. The carbon contents of all three were nearly the same—0.86 to 0.89 percent—and they were all drawn to the same 0.039-in. diameter. Two fatigue-testing machines[3] were used, one for the springs and the other for the straight-wire specimens.

★ ★ ★

**Stress** vs. cycles-to-cracking curves were derived from the test results. These curves showed, at a nominal shear stress range of 140,000 lb/in.$^2$, that the fatigue life of springs coiled from the vacuum-melted wire was about twice that of springs made from the cold-drawn music wire. As the primary difference in the two materials is in the size and number of inclusions each contains, the difference in fatigue life may be attributed chiefly to the greater cleanliness of the vacuum-melted material.

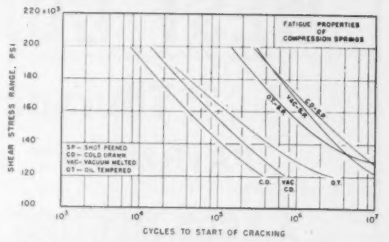

FATIGUE PROPERTIES OF COMPRESSION SPRINGS
SHEAR STRESS RANGE, PSI
CYCLES TO START OF CRACKING
SP – SHOT PEENED
CD – COLD DRAWN
VAC – VACUUM MELTED
OT – OIL TEMPERED

Figure 3.—Results obtained in fatigue tests of wire springs coiled from three different types of wire are compared with results from similar springs that were shot peened before testing. *

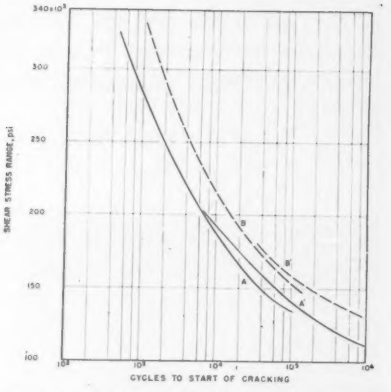



Figure 4.—Results obtained with cold-drawn (A) and oil-tempered (B) straight-wire samples in reversed torsion tests are compared with the results obtained with springs (A' and B') made from the same two wires. The slightly better performance of the springs in the region of overlap is attributed to the beneficial residual stress set up in the springs by the pre-setting operation. * * * * * * *

**The** curve obtained for springs of the oil-tempered wire at the same stress range showed an increase by a factor of 5 over the cold-drawn wire. Here the difference in the two wires is in their metallurgical structure. The cold-drawn wire possesses a highly-cold-worked structure in which the grains have been fragmented and elongated along the axis of the wire, providing longitudinal planes that are inherently weak. When the wire is stressed in torsion, these planes lie parallel to a plane of maximum shear stress and afford avenues for the easy propagation of longitudinal fatigue cracks. In contrast, the oil-tem-

(*Please turn to page* 499)

# THE
# WEST COAST REGIONAL MEETING

## Thursday and Friday, June 4-5, 1959

### FAIRMONT HOTEL, SAN FRANCISCO, CALIF.

### A GOOD MEETING FOR WIRE MEN. ALL ARE CORDIALLY INVITED.

## *The Program*

**THURSDAY, JUNE 4**

**10:00 A.M.—Registration in the lobby of the Fairmont Hotel.**

**1:30 P.M.—Technical Session—for which six papers are scheduled.**

PAPER: Bolt and Nut Specifications.

PAPER: Heat Treating of Steel Wire—Low and High Carbon.

PAPER: Storage and Shipping of Wire and Fabricated Wire Products.

(Coffee break)

PAPER: Heat treating from the Vendor's Standpoint.

PAPER: Plating of Wire and Wire Products (Baskets, etc.)

PAPER: Spring Wire—Bedding, Upholstery, Mechanical, etc.

The first three papers will be presented by wire mill men and the last three by men who are product manufacturers.

(Evening open)

**FRIDAY, JUNE 5**

**9:30 A.M.—Busses will leave for a tour of Colorado Fuel & Iron Corporation's Wire Mills at South San Francisco. Luncheon will be served through the courtesy of C.F.&I. For the return trip, it is planned to take visitors back to the hotel via the scenic ocean highway.**

**6:30-7:30 P.M.—Hospitality Hour—Courtesy of several companies.**

**7:30 P.M.—The Dinner. An after-dinner speaker of note will address the gathering on the significance of guided missiles.**

**DOOR PRIZES, AS IN PREVIOUS YEARS, WILL BE GIVEN.**

The Program Chairman of the 1959 meeting is LLOYD W. ALBRIGHT, Manager of Wire and Hardware Sales, Pacific Coast Division, Colorado Fuel & Iron Corp., Oakland.

***Plan now to attend this meeting. Hotel reservations should be made direct with the Fairmont Hotel management.***

***One fee, $11.00 for members and $13.00 for guests, covers all charges.***

## THE WIRE ASSOCIATION

**RICHARD E. BROWN, *Executive Secretary***

**453 MAIN STREET** • **STAMFORD, CONN.**

# Soldering Chromel and Alumel Wires

by Thomas A. Dickinson
Los Angeles, California

**This article describes a process developed for soldering wires for thermocouple connections and contacts.**

**Chromel** and alumel wires and contacts for thermocouple connections are being silver soldered with exceptional efficiency by means of a process recently adopted by the Convair Division of General Dynamics Corp., San Diego, Calif.

★ ★ ★

**Thermocouples** are instruments of much importance in the construction of supersonic aircraft and missiles because their ability to detect small changes in temperatures can provide either human or electronic brains with much of the information required to complete a given mission.

★ ★ ★

**Probably** the most sensitive thermocouples in current use have chromel and alumel conductors joined at their extremeties, so that the dissimilar materials will produce thermoelectric current when they are exposed to heat—for example, in an aircraft power plant. To be satisfactorily used, the latter current must be conducted via insulated chromel and alumel wires to indicators or related devices some distance away from the thermocouples.

★ ★ ★

**Solder** joints between wires and instrument contacts do not require high mechanical strength, but they must be capable of maintaining firm electrical connections at elevated temperatures. Further, to prevent a loss of instrument sensitivity due to the dissipation of thermoelectric current, they must be joints of minimal size.

★ ★ ★

**Convair** workers produce such joints without any appreciable number of rejections by using brazing torches to fuse small quantities of silver solder into areas adjacent to wire terminals and connector contacts.

★ ★ ★

**Silavoy** and Handy & Harman products with a melting point of 1125°F. and a flow point of 1145°F. are among the more suitable types of silver solder. They are purchased as wires with diameters ranging from 0.010″ to ⅛″ for the soldering of joints with varying dimen-

(*Please turn to page* 501)

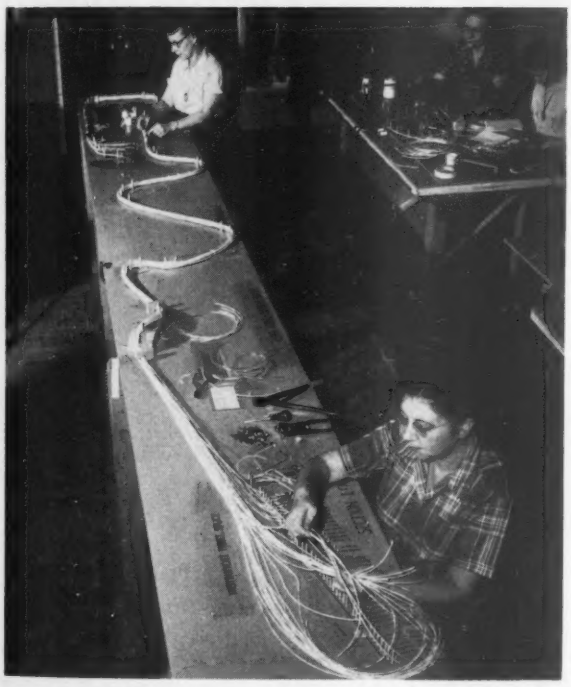


Fig. 1 (above)—Laying out alumel-chromel wiring for thermocouples on panel-type fixture, preliminary to the soldering of wire ends to contacts. ★ ★ ★ ★ ★ ★ ★ ★ ★

Fig. 2 (right)—Worker uses gas torch in soldering alumel-chromel wires to contacts for an aircraft thermocouple. ★ ★ ★ ★ ★ ★ ★ ★ ★

# Government Wire Production Information

### NBS Research Publication

**"Research** Highlights of the National Bureau of Standards," Annual Report, 1958, National Bureau of Standards Miscellaneous Publication 226, 138 pages, 45 cents. (Order from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

★ ★ ★

**This** report highlights research and development programs for fiscal 1958 at the National Bureau of Standards. It describes a wide range of scientific studies, laboratory experiments, instrument developments, and technical publications.

★ ★ ★

**The** Bureau's basic role in the scientific community is leadership in the science of measurement. This requires, in part, developing and improving physical standards and standard materials; developing, refining, and fostering the use of measuring techniques and instruments; and determining precisely properties of materials not known with sufficient precision elsewhere.

★ ★ ★

**The** space age is putting increasing demands on the Bureau. Industry needs gage blocks calibrated to an accuracy of one part in ten million, missile and aircraft development requires new and improved heat resistant coatings, metals, and alloys, telemetering equipment, and above all, new and improved measuring methods and equipment. These are some of the areas in which the Bureau is actively interested, and which are included in this report.

★ ★ ★

**Progress** in the continuing effort to increase the range and precision of physical measurements is detailed. Constructing an improved standard of capacitance, developing piston gages for use at pressures up to 200,000 lb/sq. in., increasing the accuracy of pyrometer calibrations at temperatures between 2,000° and 4,000°C, and an atomic beam wavelength source to act as a standard of length are only a few such programs completed or advanced during the year.

★ ★ ★

**In** addition to these features, the report describes the Bureau's role in the International Geophysical Year, and many basic research projects, such as the redetermination of the gyromagnetic ratio of the proton, and the study of free radicals and high-energy boron fuels.

★ ★ ★

**Included** in the publication is a


MARKING WHEELS and MACHINES for ELECTRIC WIRE

Gillies Engraved Concave and flat marking wheels are widely used printing the I.P.C.E.A. color code, numerical, semi-spiral striped, dating, or manufacturer's identification, etc. on insulated wire, tubing or hose.

Machines print on ONE or BOTH SIDES in large legible letters. Wheels are adaptable to any machine—or we will supply the machines.

Wheels, shafts, ink pans and all accessories are readily removable for quick and easy cleaning.

Wheels are made of TOOL STEEL, HARDENED to Rockwell test 61-64 and HARD CHROME PLATED.

Send for samples of wire and prices on wheels and equipment.

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review of the Bureau's services to science and industry through testing and calibration of measuring instruments, and through the distribution of standard samples. The Bureau's program of co-operation with scientific and technical groups, both in this country and abroad, and with other Government agencies, is the subject of another section of the report.

★ ★ ★

**Foreign remittance must be in U. S. exchange and should include an additional one-fourth of the publication price to cover mailing costs.**

## DuPont Booklet on Extrusion

**The Polychemicals Department of E. I. du Pont de Nemours & Co.,** Wilmington 98, Delaware, has published a 16-page booklet providing users of Athalon, Rulan and Zytel with extrusion conditions for these plastic materials.

★ ★ ★

It gives information on the design of equipment, extrusion processes, dies, temperatures and many other factors relating to satisfactory work. A two-page "Problem Solving Chart" is included.

★ ★ ★

Fully illustrated and supported by tables, formulae and other material, this work should prove definitely helpful. For a copy, please ask the company for Bulletin WC-2.

## Foreign-Made Fasteners To Be Identified

**Columbia Fasteners, Inc.,** Freeport, Long Island, N. Y., has agreed to stop selling foreign-made fasteners without clearly disclosing the country of origin on the packages in which they are sold. The agreement was obtained by the Federal Trade Commission. It does not constitute admission by Columbia that it has violated the law.

★ ★ ★

**The Tubular & Split Rivet Council,** which represents the largest manufacturers of such rivets in the United States and Canada, hailed the agreement as a deterrent to the practice of a few importers and jobbers of comming-

For Moisture Resistance, Specify

**TEXTILENE**

**TWI-FLEX and TWI-WAX**

**Treated to reduce wicking and prevent leaching,** lightly waxed Textilene Twi-Flex and heavily waxed Textilene Twi-Wax provide effective resistance to moisture. Both fillers are extensively employed for non-metallic sheathed cable (building wire), maritime shipboard cable, varnished cambric cable, and underground service entrance cable.

**Twitchell's superior Textilene line** also includes: Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all portable and flexible cords.

Fungus-resistant filler — *Twi-Tar.* Used for buried communications cable, expanded ACSR cable, and in other applications.

*Patent Applied For

**For Every Wire and Cable Application**
**Twitchell's TEXTILENE Fillers Fill The Bill**

**Quality-controlled materials** that are dependably uniform . . . in standard forms, or customized to special needs.

**Assured supply** from a reliable domestic source . . . always available in economical and convenient packaging.

**Initial low cost** with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

**Proved performance** as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

**FREE** — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation — also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

**E.W. TWITCHELL INC.**

**Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800**

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

# Wire Men Who Want **Reel** Service

*Call* **APCO MOSSBERG** *First!*

**Any size, any shape, any time!** Apco Mossberg steel reels, spools and bobbins are designed exactly the way you specify, delivered on the day you specify.

**Whether it's for drawing,** stranding or any other type of processing . . . each Apco unit is custom-made to extremely close tolerances to run true without wire breakage or trapping. Each keeps machine downtime to the minimum . . . gives you a steel-strong, easy-spooling production package that pays off in on-the-line economies.

**Tell us your wire** or wire handling problems. Apco's engineers, experience, and 50 years of reel service will come up with an answer that makes real sense. Write, wire or phone collect.

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APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS


ling domestic fasteners with imports for the purpose of deceiving customers.

## The Physical Chemistry of Steelmaking

**This** is a new book published jointly by **The Technology Press** of the Massachusetts Institute of Technology and **John Wiley and Sons, Inc.** It was compiled by **John F. Elliott,** Associate Professor of Metallurgy at M.I.T.

★ ★ ★

**The** book contains 257 pages of material in the form of papers presented at the Conference on the Physical Chemistry of Iron and Steelmaking held at M.I.T. in 1956. These papers cover a diverse group of topics of recent origin and summarize the thinking of a number of leaders in the field of ferrous metallurgy. The results of recent fundamental research are included, and the applications of this research to current problems is pointed out.

★ ★ ★

**Nine** sections of the book, each containing a number of papers, cover the different phases of steelmaking.

★ ★ ★

**The** publication, which is 8¼" x 11" in size, sells for $15.00 and may be procured from John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

## Variable-Speed Sheave

**Wood's** MS series variable-speed pulleys incorporate a new design that eliminates fretting corrosion as well as freezing and sticking. Bearing surfaces are re-oiled from an oil reservoir with each rotation of the pulley. The continuous rotational pumping action of the flange hub on the sleeve constantly renews and evenly distributes the oil film on the bearing surfaces.

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A series of nylon-faced rubber keys, located outside the bearing surfaces, transmit the power from the stationary to the moving flange through a removable sleeve cap.

The torsionally resilient keys not only carry the belt torque but assure even distribution of the load and equal transmission of power by both flanges.

★ ★ ★

The new MS series consists of five pulleys, rated respectively 2, 3, 5, 10 and 15 hp.

★ ★ ★

For full details, write **T. B. Wood's Sons Co.**, Chambersburg, Pa.

## New Wire Company in Australia

**The Broken Hill Proprietary Co. Ltd.**, Melbourne, Australia, has announced the formation of a wholly-owned subsidiary to serve as a holding company for **Rylands Bros. (Aust.) Pty. Ltd., Lysaght Bros. & Co. Pty. Ltd., Bullivant's Australian Co. Pty. Ltd.**, and **The Australian Wire Rope Works Pty. Ltd.**

★ ★ ★

The diameters of four operating companies are **Messrs. F. Jenks** (Chairman), **J. K. MacDougall** and **E. G. Sillcock.** Mr. Jenks is also General Manager and **G. W. Henderson** is General Service Superintendent.

★ ★ ★

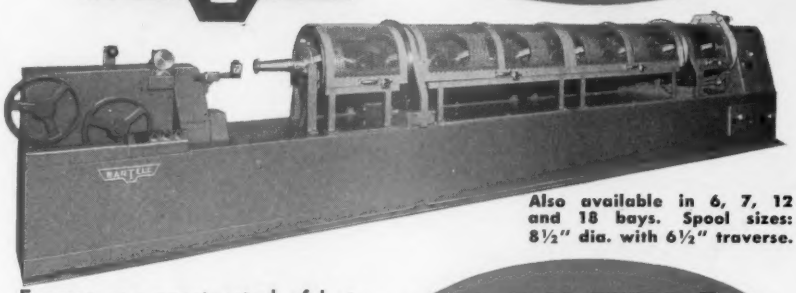
**Rylands Bros.** has a new manager in the person of **K. Sill** and a new manager for its Geelong plant —**L. H. Banks.** At the same time it was also announced that this company has added 5 new wire drawing machines, 2 of which are high speed heavy wire machines and 3 are for intermediate wire sizes, one of the latter having a finishing speed of about 3500 feet per minute, which the company's executives believe is the highest speed attained for the drawing of high carbon steel wire anywhere in the world. It is a 6-block machine.

## New Compact Fenn Wire Line

A new Fenn Compact 5-in-1 Wire Line was introduced and displayed in operation at the Metal Show. The unit occupies an absolute minimum of floor space.

★ ★ ★


BARTELL FOR THE BEST



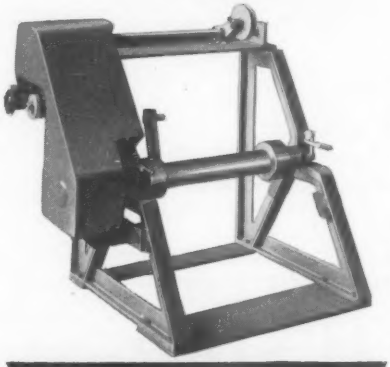
Also available in 6, 7, 12 and 18 bays. Spool sizes: 8½" dia. with 6½" traverse.

BARTELL SEVEN BAY HIGH SPEED STRANDER MODEL 7B-58-15

Frames are constructed of hot rolled shapes and plates to form a rigid box structure. Barrel is extruded 6062T-6 aluminum — Smooth starts through slip clutch driven by 7½ H.P. motor — Operators control station at front of machine — Main power control center at drive end — Electronically controlled automatic stop energizes solenoid operated brakes in event of wire breakage — Spool cradles and associated parts are completely interchangeable from one machine to another — Tungsten carbide wire guides throughout — Lay from ¼ in. to 5 in. long.

• CATERPILLAR CAPSTANS • SINGLE AND MULTIPLE HEAD RE-SPOOLERS • TAKE-UP & PAY-OFF STANDS FOR PLATING EQUIPMENT • WIRE STRANDERS

BARTELL TAKE-UP



This Take-Up is belt-driven, the drive originating from a slip clutch located outside the capstan box. Electrically operated traverse adjustable from zero to maximum reel width. Accommodates reels up to 30" dia. Speed selector sheave adjusts lay on reel to suit diameter of finished strand.

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS

BARTELL MACHINE-TOOL CORP.
YACHT CLUB ROAD ROME, N. Y.
• DESIGNERS • MANUFACTURERS • ENGINEERS • CONSULTANTS

beautiful products

from

CONTINENTAL® WIRE

EXAMPLE
FIREPLACE CURTAIN SCREEN WIRE

The beauty and smooth operation of fireplace curtain screens depend on accurate forming, even spacing, and neat appearance of the mesh. The wire used must be of correct temper, diameter and finish. Uniformity of these properties is of prime importance. Leading fireplace equipment makers choose Continental Wire because it possesses these features dependably, in coil after coil. The ability to take intricate forming is an important reason why Continental Wire is specified for scores and scores of other products made with wire. Continental Curtain Screen wire, 19 gauge through 20 gauge inclusive in size, is available in 500 pound to 650 pound catchweight single length coils packed in Leverpac Drums for faster weaving with less down time, cleaner handling and better storage. For wire in practically any size, finish, temper or analysis, in low or medium low carbon steels, see Continental first!

Fine Finishes in Manufacturers' Wire

CONTINENTAL STEEL CORPORATION

KOKOMO • INDIANA

**PRODUCERS OF:** Manufacturers' Wire in many sizes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright and special shaped wire. Also Welded Wire Reinforcing Fabric Nails, Continental Chain Link Fence, and other products.


With a capacity up to 3/8" entry diameter and at production speeds up to 600 fpm, the line performs the following operations: Draws entry wire to accurate size through carbide dies; flattens wire in a precision Fenn 8" mill equipped with carbide shell rolls with both internal and external cooling; sizes and edges flat in the versatile Fenn 3TH Turks Head. Exit flat is gaged for thickness with Pratt & Whitney electro-limit gage. A Fenn Hydraulic Traversing Take-up Reel coils in accurately traversed bundles. The entire line operates from a single, infinitely variable speed, AC motor with simple electric drive.

★ ★ ★

**Complete** information and specifications are available from The Fenn Manufacturing Company, Newington, Conn.

## Introduces High Tensile Cap Screws and Nuts

A new line of cap screws and nuts with the greatest tensile strength ever offered is being introduced by **The Bowman Products Co.**, 850 E. 72nd St., Cleveland, Ohio.

★ ★ ★

**Called** Bowmalloy, this new line of cap screws is designed to satisfy the high quality needs of today's larger, more powerful, faster operating, higher capacity equipment.

★ ★ ★

**Bowmalloy** cap screws have a proven tensile strength of 186,820 pounds per square inch, far exceeding CAA bolt tensile strength requirements.

## Booklet on Aluminum Fencing

A comprehensive review of aluminum's role in the growing fence market today is presented in a new booklet entitled, "Chain Link Fencing of Alcoa Aluminum."

★ ★ ★

**Published** by **Aluminum Company of America**, the new 12-page booklet outlines details of actual highway, industrial, and munici-

pal installations of aluminum chain link fence.

★ ★ ★

**Technical** data on strength, resistance to corrosion, and durability is presented. Tensile strengths after 20-years' exposure, as well as suggested aluminum alloys, are included.

★ ★ ★

A companion publication, also just released, is a folder of suggested specifications for this product. Both may be obtained by writing 762, Alcoa Building, Pittsburgh 19, Pa.

## To Represent Industrial Wire Cloth Firm

**S. Straus Company,** 45 No. Station Plaza, Great Neck, N. Y., has announced its appointment to represent **Ing. Fritz Lose KG** of Hanau, Germany, for the Eastern half of the United States.

★ ★ ★

**This** company is one of Germany's leading manufacturers of micro and fine wire cloth principally for the filtering and screening industry, having facilities for producing woven wire cloth in all metals, including monel, stainless steel and bronze.

## New Pancake Motor

**The Louis Allis Co.,** Milwaukee 1, Wis., has published a four page bulletin, No. 2150, on its new drip-proof Pancake Motor that reduces motor length up to 54% over standard motors.

★ ★ ★

**The** bulletin presents full engineering information on this flange type motor of conventional radial air-gap design that is intended for use on machine tools, roof-ventilating fans and other space-cramped applications. A cutaway drawing shows how the motor achieves its short length through formed end coils and a one piece housing-bearing bracket.

★ ★ ★

**Additional** motor features presented are: rugged cast iron construction, modern appearance, fac-


*Insure safe delivery of your cable with*

NYECO Steel Shipping Reels

124-INCH DIAMETER 50 TON CAPACITY STEEL REEL
For oil filled cable. Designed and fabricated for the GENERAL CABLE CORPORATION, Bayonne, N. J.

These leading mills are just a few of the many that use NYECO Steel Reels: GENERAL CABLE, OKONITE, ROEBLING, WESTERN ELECTRIC, ANACONDA, PHELPS DODGE.

MODERNIZE and enjoy greater protection against damage in shipping and processing with NYECO steel reels. Rugged, weather-resistant, splinter-proof, warp-proof... protects costly cable against damage due to dropping, bouncing, rough handling. Cost little more than wooden reels... last up to 10 times longer ...require minimum maintenance. Protect your investment and reputation by using NYECO steel reels.

YOUR INQUIRIES WILL RECEIVE OUR PROMPT ATTENTION

Send specifications for STEEL SHIPPING REELS, IMPREGNATING REELS, PROCESSING REELS, SUBMARINE CABLE REELS AND BRIDGE REELS. Prompt deliveries on large or small orders.

NYECO ALSO MANUFACTURES

- Impregnating Tanks
- Caterpillar Take-ups
- Floor Rolls
- Stands
- Vulcanizers
- Cabling Machines
- Pressure Vessels

ANY QUANTITY — ANY SIZE — ANY LOAD FLANGE DIAMETER from 36" up

Specialists to the wire industries for over 50 years.

NEW YORK ENGINEERING COMPANY

75 WEST STREET • NEW YORK 6, N. Y.

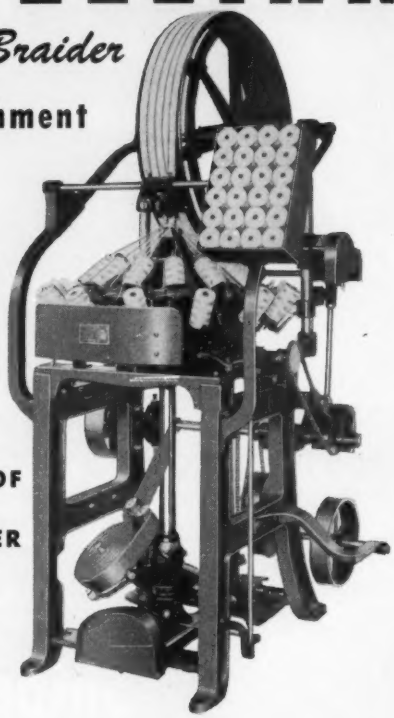
TELEPHONE: WHitehall 4-5380 • CABLE: NYECO, N. Y. • PLANTS: YONKERS, N. Y.

# WARDWELLIAN

## *24 Carrier Cable Braider*

**With Taping Attachment**

*Applies Tape and Braid to Conductor Simultaneously*



**HAS ALL THE FEATURES OF WARDWELL STANDARD 24 CARRIER CABLE BRAIDER**

- Taping head has means for adjusting the tension applied to the tape, thereby assuring a uniform lay.

  A mechanical stop motion which operates upon breakage or exhaustion of the supply, stops both the taping head and braider head at the same time. This eliminates the possibility of braiding over the conductor when the tape is not being applied.

  Change gears for altering the lay of the tape are conveniently located at front of the machine.

  Due to the space required for the taping attachment, this machine can be furnished with high stand only.
- Production 54" to 259" per minute depending upon the texture of the product.
- Standard set of twelve change gears furnished with each machine.
- Machine can be adapted to produce one-and-one braid by changing thread deflectors.
- Carrier speed 75 R.P.M. for cables from ¾" diameter to maximum of 1⅛" diameter or 500,000 circular mils; production 900 picks or plaits per minute.
- Carrier speed 100 R.P.M. for cables ¾" diameter and smaller, 1,200 picks or plaits per minute.
- Equipped with "Maxitorq" clutch; 12" driving pulley, 3" driving belt.
- Speed of braider countershaft 345 R.P.M. for carrier speed of 75 R.P.M. or 460 R.P.M. for carrier speed of 100 R.P.M.
- Ratio of braider countershaft speed to carrier speed 4.6 to 1.
- Capstan 36" diameter, 6" face.
- Beater opening 1¾" diameter.
- Supply yarn packages Universal wound, 2¹¹⁄₁₆" diameter, 5" traverse on tubes 5¼" long, ⅜" hole, four point wind.
- Counter for measuring product in feet or yards furnished upon request at additional cost.
- Motor drive furnished upon request at additional cost.
- Power required dependent upon conditions. Estimate furnished upon request.
- Supply and windup stands are not furnished.
- Weight approximately 1850 lbs.
- Weight crated for domestic shipment approximately 2000 lbs.
- Weight boxed for export shipment approximately 2500 lbs. or 1134 kilograms.

TAPING ATTACHMENT DATA:

- Maximum number of turns of taping head 100 R.P.M. — minimum 16 R.P.M.
- Maximum diameter of supply package 12".
- Maximum width of tape 3".
- Minimum width of tape ¾".
- Size of hole in tape package 3".
- Taping head is equipped to run either clockwise or counter-clockwise.

REPRESENTATIVES FOR EUROPE, BRITISH COLONIES AND DEPENDENCIES
JAMES MACKIE & SONS, LTD.
BELFAST, IRELAND

*Wardwell*
BRAIDING MACHINE CO.
CENTRAL FALLS, RHODE ISLAND, U.S.A.

133-9


tory lubricated bearings and quiet operation. This drip-proof Pancake Motor is offered in ratings from 1 to 15HP. In all ratings it can be furnished with an integrally mounted brake. Conventional electrical design permits modification of the motor for high torque, reversing duty, multispeed or intermittent duty applications.

### Prentiss Wire Stitches a Lot of Cartons

**Stitching** wire produced at **Prentiss Wire Mills,** Riverside-Alloy Metal Division, H. K. Porter Company, during 1958 was used to stitch an estimated two billion, four hundred million cartons. This figure tops all production records in the 101 year history of Prentiss. A greatly increased use of box stay wire has paralleled the phenomenal growth of the corrugated box industry. Industry spokesmen indicated that 1957's sales of corrugated cartons totaled over $921 million. According to the 1958 figures, as estimated by Prentiss, the industry may have already become a billion dollar activity.

### Polymer Announces Availability of Fluidized Bed Process Licenses With Corvel Resin Powders

**To** meet the growing demand for use of the patented fluidized bed process to coat metals with plastics, process rights have been made available to all purchasers of Corvel fusion bond finishes, The Polymer Corporation, 2120 Fairmont Ave., Reading, Pa., has announced.

★ ★ ★

**These** finishes, available from **National Polymer Products, Inc.,** a Polymer subsidiary, are resin powders specially formulated for use in the fluidized bed process.

★ ★ ★

**The** process, developed in Europe by Knapsack-Griesheim, A. G., Frankfurt, Germany, is covered by a United States patent. Polymer Processes, Inc., another Polymer subsidiary, which has exclusive licensing rights in the United States, had previously made process rights available to selected licensees only.

★ ★ ★

Under the new program, purchasers of Corvel resin powders will automatically be licensed by Polymer Processes to use the fluidized bed process, details concerning which are available upon request.

### Bulletin on Heat Resisting Alloys

**Techalloy** offers new bulletin listing the most useful temperature ranges for high temperature heat resisting alloys such as: Inconel, Incoloy, Stainless Steel, Chromax and Columbium, all in various grades.

* * *

**For** the first time charts have been made up for the above alloys on a cost comparison basis.

* * *

**The** bulletin discusses the relaxation stress and how it is related to creep or flow of metal under stress at high temperatures. This relaxation or residual stress data is invaluable to manufacturers of high temperature fasteners such as, bolts, nuts, rivets, screws and other hardware going into jet engines, missiles, rockets, along with high temperature steam plants.

* * *

**For** a copy, please write Techalloy Company, Inc., Rahns, Pa.

### Spanish Wire Men Visit American Wire Mills

**Under** the auspices of the International Cooperation Administration a group of Spanish wire men arrived in this country on January 9 to make a study of American metal and wire drawing practices. In the group were:

**Jose M. Calvo, Director (Leader)**
**Central de Fabricantes de**
**Alambressy Derivados**
**Madrid**

**Vincente C. Del Rio, Man.-Dir.**
**Pedro Garcia Losada, S.A.**
**Medina del Campo**

**Sotero Eceizabarrena, Foreman**
**O. Mustad y Cia.—Barrio San Blas**
**Tolosa**

**Felipe Garcia-Escudero, Man.-Dir.**
**Forjas Y Alambres Del Cadagua, S.A.**
**Trefileria Barbier, S.A.**
**Bilbao**

**Jesus M. Ortiz, Director of Plant**
**Nueva Montana Quijano, S.A.**
**Santander**


**ROTOBLAST DESCALING SAVES $75 A DAY**

**Pangborn Rotoblast Descaling Machine makes cost-cutting automation possible at Bustin Steel**

At Bustin Steel Co., Dover, N. J., hot rolled steel bars are descaled by a Pangborn Rotoblast Machine at rates up to 180 linear feet per minute. This speed of operation plus the perfect quality of work—eliminating oiling and degreasing operations later—permits inserting this Rotoblast Machine directly at the head of the production line, working toward a completely automatic manufacturing operation.

The operating cost of this machine saves Bustin at least $75 a day compared to pickling, *plus* the cost of degreasing *plus* savings resulting from longer tool and die life.

For information on how Pangborn Rotoblast can save *you* money, write PANGBORN CORP., 5400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment and Rotoblast Steel Shot and Grit.*

**Pangborn** **CLEANS IT FAST WITH ROTOBLAST®**

# HOW TROUBLE-FREE ARE YOUR ROD and BAR CUTTING OPERATIONS?

Check them with the—

HKP® PORTER ONE-HOSE *Hydraulic* ROD and BAR CUTTER

IT CUTS COSTS . . .

SPEEDS PRODUCTION!

If your rod and bar cutting costs are sky-high why not look at the PORTER HYDRAULIC ROD and BAR CUTTER. Steel mill men who size it up usually put it to work — because one or more combination of the 3 Cutterheads and 5 Power Units, turns out to be the team that speeds their output, slashes their costs. Here's why:

**CUTTERHEAD PROTECTION — that eliminates constant "TIME OUT" and HIGH MAINTENANCE COSTS!**

- **LONGER BLADES** with more bearing surface and rigid alignment eliminate side thrust and blade breakage.
- **FILTERED AIR** taken into the cylinder is forced out around the movable blade on each cut — eliminates the danger of dirt reaching bearing surface causing oil leakage and wear.
- **CONCENTRIC DESIGN** eliminates excessive wear of cylinder wall and ram.
- **LARGER CYLINDER AREA** allows the tool to cut capacity stock at a lower operating pressure, resulting in longer life for seal and hose.
- **SAFE, 12 VOLT CONTROL SWITCH** at the cutterhead gives instant finger-tip performance.
- **"KEY-POINT"** wear and replacement reduced to the minimum because of these exclusive HKP features.

**A TRUE HYDRAULIC SYSTEM with these efficient, maintenance-saving features:**

- **CONTROL VALVE** big and accurate enough for all industrial work. Solenoid operated.
- **EASY TO CHANGE RESERVOIR TYPE 10-MICRON OIL FILTER.**
- **PLUS** many other exclusive HKP features.

Ask to have a Porter Engineer tell you how the 3 CUTTERHEAD sizes and 5 HYDRAULIC POWER UNITS can provide the exact combination for your requirements.

OR — WRITE FOR COMPLETE PORTER HYDRAULIC ROD and BAR CUTTER FOLDER.

**ATTENTION!** Production and Quality Control Depts. Ask about our **NEW UPSET TESTING MACHINE!**

**H. K. PORTER, INC.** Somerville 43, Mass.


**Alfonso Perez-Yarza, Mech. Eng.**
**S. A. Basconia**
**Bilbao**

**Enrique F. Piera, Genl. Mgr.**
**Juan Piera, S.A.**
**Barcelona**

**Delmiro Riviere, Vice Pres. of Production & Genl. Mgr.**
**Altos Hornos De Cataluna, S.A.**
**Sema Industries, S.A.**
**Barcelona**

**Marino Vicinay, Eng.-Tech. Dir.**
**Vicinay, S.A.**
**Bilbao**

**Rafael Cabezudo, Chief Eng.**
**Nueva Montana Quijano, S.A.**
**Santander**

**Joaquin Mateo, Tech. Mgr.**
**Tuperin**
**Barcelona**

**Jose Ruiz, Tech. Mgr.**
**Eugenio Ruiz-Garcia**
**Valencia**

**Antonio Tomas, Manager**
**Industrias Tomas, S.A.**
**Murcia**

★ ★ ★

**The** group called at the offices of **The Wire Association** in Stamford, Conn., where they spent two hours discussing the Association's activities, the function and purposes of Wire and Wire Products and the wire industry in general with **Edmund D. Sickels,** Editor of the magazine.

★ ★ ★

**Following** the visit the team went to Port Chester, N. Y., to make a tour of **Russell, Burdsall and Ward Bolt and Nut Company's** plant.

★ ★ ★

**Other** plants in their itinerary included **Newark Wire Cloth Co.,** Newark, N. J.; **The Englander Co.,** Bayonne, N. J.; **Igoe Brothers, Inc.,** Newark, N. J.; **American Steel and Wire Division** plants in Worcester, Mass., and Donora, Pa.; **Morgan Construction Co.,** Worcester, Mass.; **Sleeper & Hartley, Inc.,** Worcester, Mass.; **New England High Carbon Co.,** Millbury, Mass.; **Wickwire Spencer Steel Division,** Buffalo, **N. Y. Buffalo Bolt Co.,** No Tonawanda, N. Y., **Vaughn Machinery Co.,** Cuyahoga Falls, Ohio; **Macwhyte Co.,** Kenosha, Wis.; **Chicago Steel & Wire Co.,** Chicago, Ill.; **Republic Steel Corp.,** So. Chicago, Ill.; **Wilson Steel & Wire Co.,** Chicago, Ill.; **Mid-West Spring Mfg. Co.,** Chicago, Ill.; **Firth-Sterling, Inc.,** Pittsburgh, Pa.; **John A. Roebling's Sons Corp.,** Roebling, N. J.; **Riverside-Alloy Metal Div., H. K. Porter**

Co., Riverside, N. J.; and various governmental agencies, laboratories, etc. The group concluded its tour of these plants and offices and departed for Spain on February 20.

### Colored Vyna-Kote Offered in Kit Form

**Spectra-Strip Wire & Cable Corporation** announces a new deal for Vyna-Kote, liquid vinyl. This handy material for the repair of all kinds of damage to vinyl insulated wires is now being offered in Kit form. The Kit consists of 12—2 ounce bottles, 1 each of 10 colors, 1 Clear and 1 Thinner, all arranged on a nicely finished hardwood stand.

★ ★ ★

**Vyna-Kote** is a unique material, and saves many times its cost in the repair of solder iron burns, insulating terminals, fixing burn back at solder joints etc.

★ ★ ★

**Full** details from **John Ford,** Sales Manager, Spectra-Strip Wire & Cable Corporation, Box 415, Garden Grove, Calif.

### Ransohoff Bought by Roto-Finish

**Two** of the oldest and largest companies manufacturing machinery for the surface treatment of metals were combined as of December 31, 1958.

★ ★ ★

**Gunther W. Balz,** President of the **Roto-Finish Company,** Kalamazoo, Mich., manufacturers of precision barrel finishing machinery, announced the purchase of **Ransohoff, Inc.,** Hamilton, Ohio. Ransohoff manufactures metal finishing, phosphating, pickling and paint finishing systems, foundry equipment including foundry mills and automated combinations of this equipment.

★ ★ ★

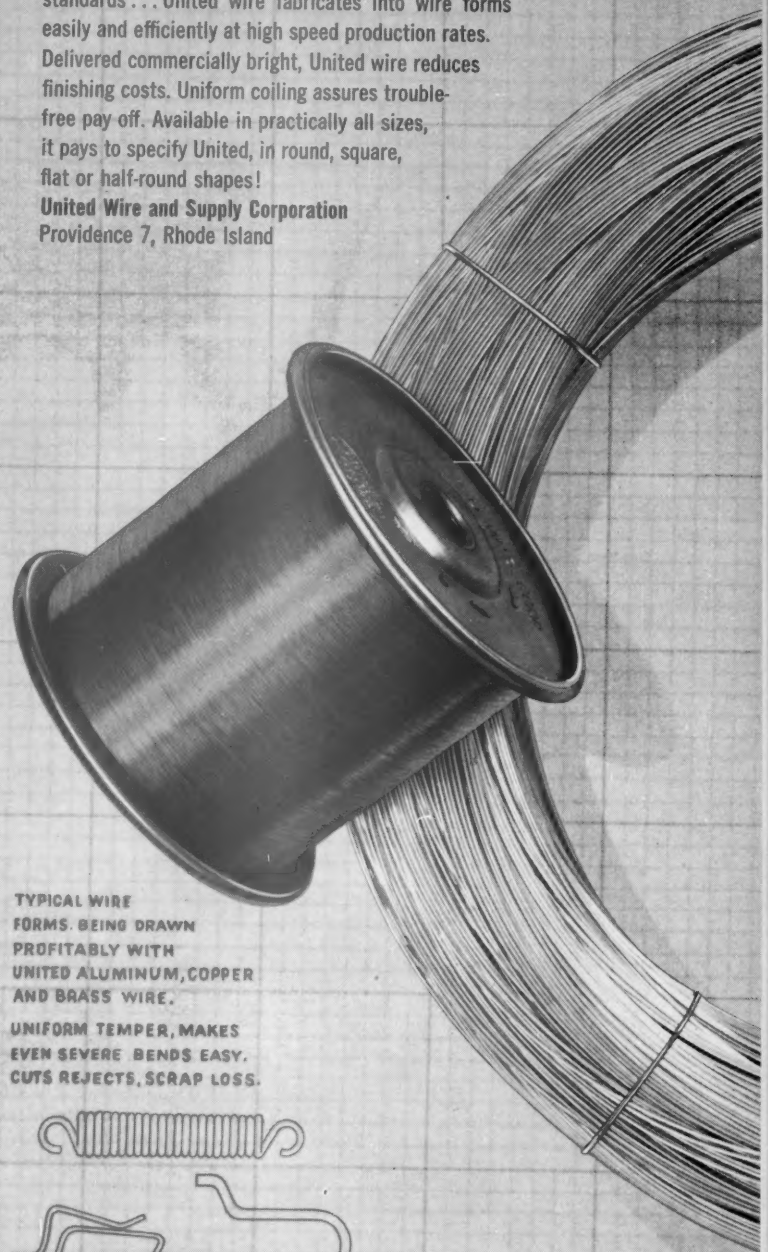
**Mr. Balz** stated that no material changes were contemplated in the personnel or the operations now being conducted at the Hamilton, Ohio Plant of Ransohoff. R. E. Wigger, Vice President of Ransohoff, Inc., will be in charge of the


TOLERANCE

Reason why — it Pays to Specify
**United** Aluminum, Brass and Copper **Wire**

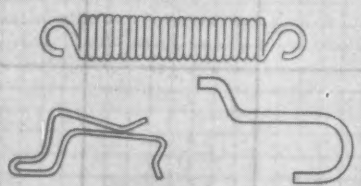
Drawn or shaped to your most exacting tolerance and temper standards . . . United wire fabricates into wire forms easily and efficiently at high speed production rates. Delivered commercially bright, United wire reduces finishing costs. Uniform coiling assures trouble-free pay off. Available in practically all sizes, it pays to specify United, in round, square, flat or half-round shapes!

**United Wire and Supply Corporation**
Providence 7, Rhode Island



TYPICAL WIRE FORMS. BEING DRAWN PROFITABLY WITH UNITED ALUMINUM, COPPER AND BRASS WIRE.

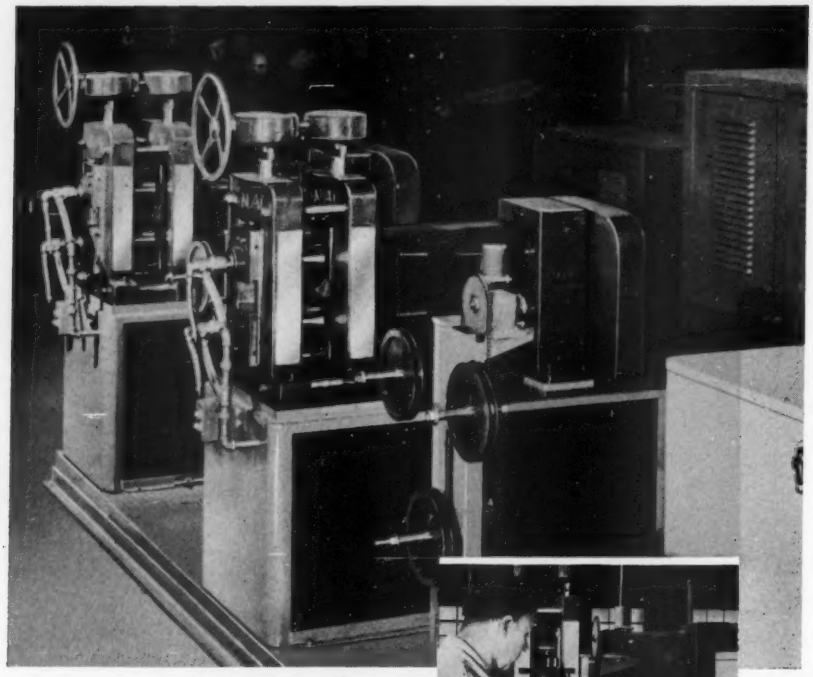
UNIFORM TEMPER, MAKES EVEN SEVERE BENDS EASY. CUTS REJECTS, SCRAP LOSS.

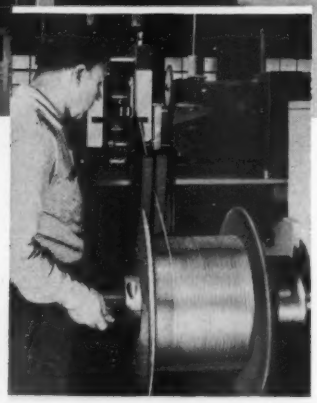


For aluminum, brass and copper wire and tube
For silver brazing alloys . . . always **Specify**

Permanently United

UNITED





**HIGH PRODUCTION** *Wire Flattening* **MILLS**

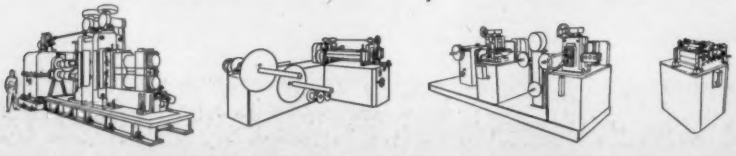
Now you can get extremely close tolerances combined with high speed production, with Stanat Wire Flattening Mills. These Stanat mills can be used to produce a wide variety of flat and shaped wire.

Designed to offer maximum flexibility of operation and arrangement, Stanat mills are available either as completely self-contained package units or as individual components for erection at your plant.

Stanat wire mills are available in 4", 6", 8" and 10" roll diameters, with optional equipment to fit your individual production requirements.

■ Find out how you can get increased production and greater profits with Stanat Wire Mills. Write today for further information.

**STANAT** MANUFACTURING CO., INC. / 500 SHAMES DRIVE WESTBURY, L. I., N.Y.



MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

Ransohoff operations as Executive Vice President of the new Ransohoff Company.

## Bulletins Describe Corrosion-Proof Fans

**Atlas Mineral Products Company,** Mertztown, Pa., announces the release of two new bulletins concerning two lines of corrosion-proof rigid plastic fans. Bulletin #9-20 describes the centrifugal fans featuring sizes from 10-½ to 35 inches, and Bulletin #9-21 details the twin-flow fans available in sizes from 12 to 48 inches.

★ ★ ★

**These** fans are made from Ampcoflex Type I polyvinyl chloride and offer exceptional chemical resistance with high structural strength in relation to weight.

## Coleman Cable to Move to New Plant

**Coleman Cable & Wire Company** of Schiller Park, Ill., has announced the purchase of the property formerly owned and occupied by the Norge-Chicago Corporation.

★ ★ ★

**The** property, located at 1900 N. River Road, River Grove, Ill., consists of a six-year-old 50,000 sq. ft. one story office and warehouse building, situated on a land site of approximately 10-acres.

★ ★ ★

**Upon** the completion of extensive alterations and the construction of approximately 50,000 sq. ft. of additional warehouse facilities, the total valuation of the property will be approximately $700,000.

★ ★ ★

**April** 1st, of this year, is scheduled by Coleman Cable, as the date of occupancy of its new headquarters, according to an announcement by **David Coleman,** President.

TO SELL—ADVERTISE IN WIRE AND WIRE PRODUCTS

It pays—send for rates

453 Main St., Stamford, Conn.

# Outstanding Personalities of the Wire Industry

## Appoints Regional Sales Manager

**Macwhyte Wire Rope Company** has announced the appointment of **William J. Anderson** as a Regional Sales Manager.

* * *

**Mr. Anderson** was formerly direct factory representative for Macwhyte Wire Rope Company and covered the sales district of Indiana, Southern Illinois, and Kentucky, with headquarters at Evansville, Indiana.

* * *

**He** now will be in Kenosha to supervise sales in the Midwest and Eastern sales territories.

## Alcoa Appointment

**Appointment** of **George R. Gent** to the newly created post of manager of welding, brazing, and soldering product sales, has been announced by **Aluminum Company of America.**

* * *

**Mr. Gent** will coordinate a program to utilize efficiently Alcoa facilities, to disseminate information about joining methods and materials, and to merchandise joining products and services.

* * *

**He** joined Alcoa in 1946 as a salesman. Since 1953, he has served as assistant to Alcoa's manager of wire, rod, and bar sales. He studied mechanical engineering at Michigan State University.

## National-Standard Elects New Officers

**Thomas H. Pearce** has been elected president of **National-Standard Company,** succeeding **A. H. Johnson.** He had been executive vice president for the past two years, and prior to that was vice president, engineering and manufacturing.

* * *

**Mr. Johnson,** a **National-Standard** employee for 40 years and president since 1952, joins **Walter H. Parkin** as co-chairman of the board of directors.

* * *

**William D. Peace** and **Richard W. Elder** were elected vice presidents, respectively, for rubber industry sales and specialty sales. Peace has been an assistant vice president and Elder was general sales coordinator and manager of round wire sales. All three newly elected officers are graduate mechanical engineers. **K. D. Smith** has been appointed special adviser on the rubber industry.

* * *

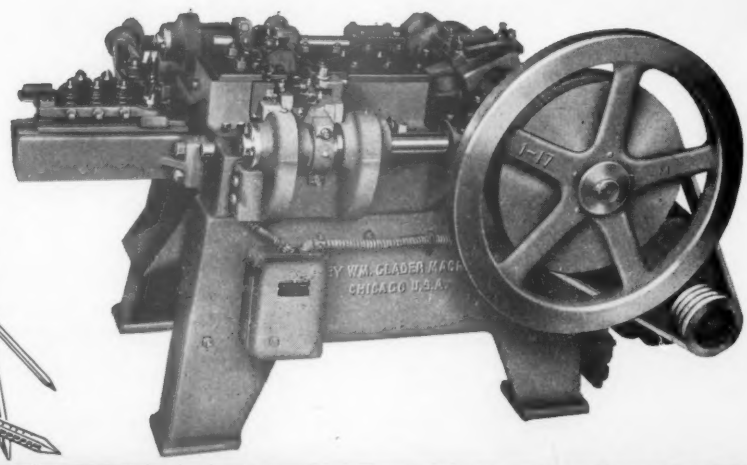
**Operating** plants in seven states,


Glader—Years of Proven Performance

GLADER NAIL MACHINES

55 YEARS of experience meeting the exacting demands of nail making.

The machine with a record of steady dependable service.



Wm. GLADER MACHINE WORKS 210 N. RACINE AVENUE CHICAGO 7, ILLINOIS

EXPORT DEPT. 122 EAST 42nd STREET • NEW YORK 17, N. Y.

Canada, England, and South Africa, National-Standard manufactures high carbon flat steel, industrial wire cloth, perforated metals, special machinery, and a variety of fine wires.

### Establishes Blast Cleaning Consulting Service

**Gilbert D. Dill,** formerly with the **Wheelabrator Corporation** and an authority on shot blast cleaning, has resigned from the company and established himself as a consulting engineer concerned primarily with blast cleaning processes and procedures. His address is P.O. Box 292, Mishawaka, Indiana, and the telephone is BL 5-6593.

★ ★ ★

**Mr. Dill** is a member of The Wire Association, before which society he has presented papers on the subject of wire rod cleaning by the shot blast process.

### Page Appointments at Monessen

**According** to an announcement by **Joseph N. Kemple,** General Manager, **Page Steel & Wire Division, American Chain & Cable Company, Inc.,** Monessen, Pa., new plant appointments have been made.

★ ★ ★

**E. M. Spadafore** has been promoted to the position of Assistant Plant Manager, reporting to **R. B. Kramer,** Plant Manager; **V. J. Dobos** to the post of Wire Mill Superintendent; and **L. R. Wetzel** to the position of Superintendent of Coating and Heat Treating Department.

### New Sales Manager for ACCO's Wright Hoist Division

**Wm. B. Ilko,** in addition to his duties as Sales Manager of the American Chain Division, **American Chain & Cable Company, Inc.,** York, Pa., has been appointed to the position of Sales Manager, Wright Hoist Division, York, Pa., succeeding **S. J. Woodworth,** according to an announcement by **Henry Ervin,** Vice President and Director of Sales. He is a graduate of Pennsylvania State University with a degree of Bachelor of Arts, Class of 1928.

★ ★ ★

**At** the same time, Mr. Ilko has announced the appointment of **T. J. Winter** to the newly created post of Field Sales Manager for the Wright Hoist Division.

### Made Asst. General Superintendent

**Edward K. Barney** has been appointed to the newly-created position of assistant to the general superintendent of **Armco Steel Corporation's** Baltimore Works. The announcement was made by **C. C. McElvain,** manager of the stainless steel plant.

★ ★ ★

**Mr. Barney** joined Armco at the Baltimore Works in 1938. He was foreman of the physical testing section of the metallurgical laboratory. In 1948 he became apprentice training supervisor and suggestion coordinator at the Baltimore plant. In 1950, he was named training advisor and was promoted to assistant supervisor of personal relations in 1953.

Here is the difference between just any reel and MPS reels with
DURA CURL RIMS
Yes, it's the exclusive MPS heavy duty thickened-section rims that assure maximum strength and rigidity throughout the reel heads. Flange run-out and straightening expenses are eliminated by this patented MPS development. DURA-CURL rims are now standard on all MPS wire drawing, annealing, and stranding spools and reels. We invite your inquiries — let us tell you more about Dura-Curl rims.
MPS
trouble-free winding spools and reels
Mossberg PRESSED STEEL Corporation
18 WEST STREET • ATTLEBORO • MASSACHUSETTS, U. S. A.
TEL ATTLEBORO 1-0848
#107

## Crucible Promotes Two Men

**F. L. Moffet** and **A. P. Terrile** have been appointed to new positions with the Metallurgical Division of the **Crucible Steel Company.**

★ ★ ★

**Mr. Moffet,** formerly chief metallurgist at the Company's Park Works in Pittsburgh, has been named material and process engineer. He will be responsible for Company-wide practices and procedures for mechanical and thermal conversion and treatment of all products.

★ ★ ★

**Mr. Terrile,** a Crucible customer contact metallurgist, has been appointed field service metallurgist. He will provide customers with technical services on all products in assigned regional areas. His first assignment is in the Western region.

## Appoints Controller

**Universal-Cyclops Steel Corporation** announces the appointment of **Arthur C. Olsen** as plant controller of the Bridgeville plant.

★ ★ ★

**Mr. Olsen** previously worked for the Utica Division of the Curtiss-Wright Corporation where he was supervisor of manufacturing costs. He is a graduate of the University of Pittsburgh.

## Armco Appoints Sales Executive

**Armco Steel Corporation** has created a new position in the sales department and has appointed **James B. Rafter** assistant manager of stainless bar and wire sales, under **S. P. Watkins,** manager of sales. The announcement was made by **W. B. Quail,** vice president in charge of sales for the Armco Division.

## Columbia-Geneva Appointments

**The Columbia-Geneva Steel Div., U. S. Steel Corp.,** San Francisco, Cal., has appointed **Charles C. Morgan,** General Superintendent of its Geneva Works at Provo, Utah. He succeeds A. E. Terry, who has retired.

★ ★ ★

**Mr. Morgan** had been General Superintendent of the Division's Pittsburg, Cal. Works. He is succeeded by **George A. Jedenoff,** who had been Asst. General Superintendent there.

## Industrial Wire Appointments

**Carl P. Clare,** President of **Industrial Wire and Cable Ltd.,** Toronto, Canada, has announced the appointment of **T. Harrison Smith** as General Manager and of Harold D. Percy as Assistant General Manager and Works Manager. Mr. Smith previously had been the head of T. H. Smith Associates of Montreal.

## Resins Firm Appoints West Coast Manager

**The Isochem Resins Corporation,** 221 Oak St., Providence 9, R. I., has announced the appointment of **Paul D. Jacobs** as its Resident Sales Engineer for the State of

HEAVY DUTY TAKE-UP
EST. 1855
AIMCO
INC. 1915
"American"
INSULATING
MACHINERY
COMPANY
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.
MANUFACTURERS OF WIRE INSULATING MACHINERY AND ALLIED EQUIPMENT. MACHINERY MFG. TO CUSTOMERS SPECIFICATIONS.
TAKE-UP
• Wire range .050" to .125".
• Speeds 500 to 1500 FPM.
• Multi-range constant tension winding drive.
• Automatic compensation for change in linear speed.
• Adjustable stalled and running tension and acceleration rate.
• Expansion type reel arbor; air ejection.
• Reels up to 30" diameter, 11" traverse, 1000 lbs. capacity.
AMERICAN INSULATING MACHINERY COMPANY
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33, PENNSYLVANIA, U.S.A.

California, with offices at 420 Market St., San Francisco.

★ ★ ★

**Mr. Jacobs** comes to Isochem with a broad background of experience in the plastics and electrical industries from the Northwestern Plastics Co., Chicago, where he was engaged in technical sales work.

★ ★ ★

**He** will direct the technical sales and field service program of the entire Isochem line of resins, which includes Isocast epoxy potting compounds, Isogel epoxy dip coating resins, Isobond adhesives, and Isofil impregnating resins.

### Appoints General Manager

**Fred A. Kaufman** has been appointed Vice President and General Manager of **Universal-Cyclops Steel Corp.,** Bridgeville, Pa. In this newly created post, he will have responsibility for the direction of sales activities and the operation of the company's plants at Bridgeville and Titusville, Pa., and Coshocton, Ohio. Previously, he was vice president in charge of its Refractomet Division.

★ ★ ★

**The** change does not affect other existing management functions of Universal-Cyclops nor the organization of Empire-Reeves Steel Corporation, a subsidiary.

### S.I.C. Elects Officers

**At** its annual meeting of stockholders, the **Standard Industrial Compounds Company** of Frankfort Ill., elected the following officers:

John A. Moritz, Jr., Pres.
Earl A. Bowers, Jr., Vice Pres.
Bruce W. Siemon, Treasurer
Wallace Solum, Secretary

★ ★ ★

**Directors** elected at the meeting included the foregoing officers and **Kent Bosworth.**

★ ★ ★

**The** Board of Directors approved the acquisition of additional property adjacent to the present plant for expansion purposes.

★ ★ ★

**The** company has announced that during 1958 additional manufacturing, mobile and conveying equipment was added and that the sales staff and laboratory personnel had been augmented in this period.

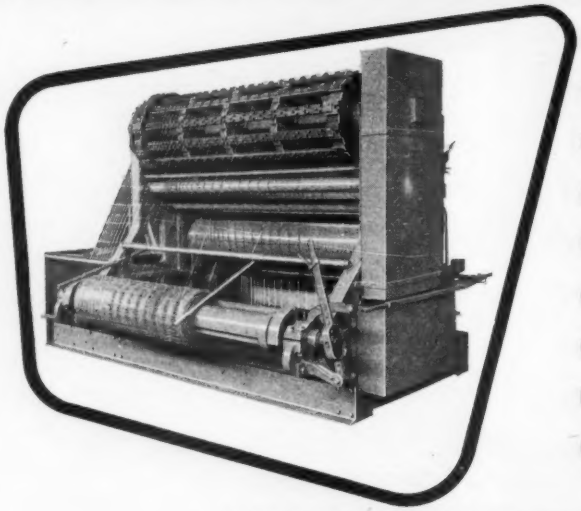
★ ★ ★

**A** completely new line of "E.P." lubricants, to meet the optimum requirements of the new high-speed wire drawing equipment that has been developed, was also made available to wire mills in 1958. Excellent results from the use of these new lubricants have been reported.

### Electric Parts Appoints Sales Manager

**Elmer W. Burton** has joined **Electric Parts Corporation,** Georgetown, Kentucky, as Sales Manager of its recently organized Wire and Cable Division, **Henry P. Theodore,** President, has announced.


*Interlocking* **FENCE LOOMS**



- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

**Write for Detailed Information — Without Obligation**

**Interlocking Fence Co., Box 8, Morton, Ill.**

***Specialists In Fence Looms***

**Mr. Burton** comes to Electric Parts from **Cords Ltd.**, Division of **Essex Wire Corp.**, where he has served as Sales Manager for the last four years. He has been associated with the wire industry for fifteen years and brings to his new assignment a broad knowledge of all phases of production and sales.

★ ★ ★

**Electric Parts Corp.**, based on its position as the only manufacturer of a complete line of automatic electric bedcoverings, has successfully expanded into the field of wire, cable and wiring devices.

★ ★ ★

"We are proud of the acceptance our wire products have gained, and are confident that further progress will be made under Mr. Burton's sales direction", Mr. Theodore said in announcing the appointment.

### Prentiss Production Appointment

**Thomas J. McDonough, Jr.**, with more than a decade of experience in the supervision of wire production, has joined **Prentiss Wire Mills, Riverside-Alloy Metal Div., H. K. Porter Co., Inc.**, as Assistant Superintendent of the Coarse Wire Department. The appointment was announced by **J. R. Fuller**, Manager of Prentiss.

★ ★ ★

In his new position, McDonough will assist in the supervision of rod break-down, coarse frames, annealing, cleaning and coating, tinning and galvanizing, and rolling and shipping. He came to Prentiss from a large West Coast wire manufacturer, where he had served in various production supervisory capacities.

★ ★ ★

A graduate of Massachusetts Maritime Academy where he specialized in Mechanical and Electrical Engineering, McDonough served in the U. S. Navy as an Engineering Officer during World War II. He received a B.S. Degree from Clark University, Worcester, Mass., and studied business administration and Mathematics at both the University of Oregon and the College of San Mateo, California.

### Appoints Salesman to Philadelphia District

**William Saltzer**, with six years experience in the inside sales department of **Riverside-Alloy Metal Div., H. K. Porter Co., Inc.**, has been appointed to the Philadelphia district sales office, according to **F. H. Conant**, General Sales Manager of the Porter Division.

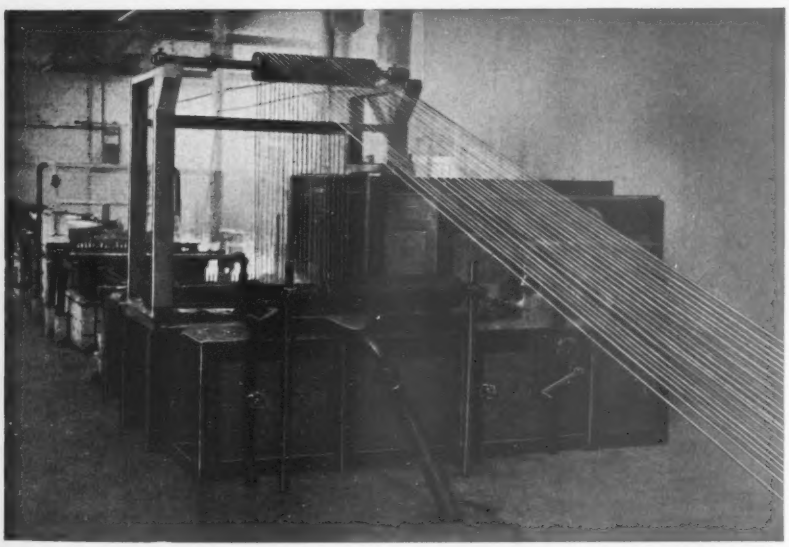
★ ★ ★

In his new assignment, he will work with **R. D. Voelcker**, District Manager, directly calling on many customers he had previously served from the home office.

★ ★ ★

A graduate from Pennsylvania's West Chester State Teachers College, he has had previous experience as a school teacher and as a laboratory employee of a large steel company He joined Riverside-Alloy in 1953.


*Galvanizing in a Ceramic Tank means saving a lot of money!*



COVER HEATED galvanizing furnace for wire
(German and Foreign Patents issued)

**UNLIMITED LIFE**
**LESS DROSS**
**LOW INSTALLATION COSTS**

*also for galvanizing*

★ **WIRE**
**HEXAGON NETTING**
**STRIP**

***Operation by Gas or Oil***

SOLE REPRESENTATIVE:
PAUL REICHER
Machinery & Equipment
P.O. BOX 127
Willowdale, Ont., Canada

OFENBAU **FRITZ** G.m.b.H. & Co. K.G. **HAGEN,** (W.-GERMANY)

### Crucible Steel Company Appointments

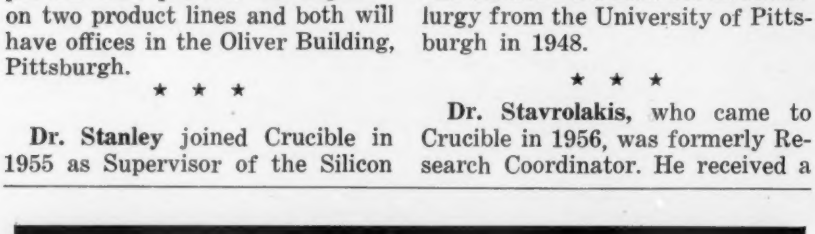
**Drs. James K. Stanley** and **James A. Stavrolakis** have been appointed Section Managers in Technical Development by the **Crucible Steel Company of America.** They will be responsible for coordination of process and product development on two product lines and both will have offices in the Oliver Building, Pittsburgh.

★ ★ ★

**Dr. Stanley** joined Crucible in 1955 as Supervisor of the Silicon Steel, Magnetic Materials, and Applied Physics sections in the Company's Central Research Laboratory in Pittsburgh. He held this position until his present appointment. He was graduated from the Case Institute of Technology in 1934, where he received a Bachelor of Science degree in Metallurgy and received a Doctorate in Metallurgy from the University of Pittsburgh in 1948.

★ ★ ★

**Dr. Stavrolakis,** who came to Crucible in 1956, was formerly Research Coordinator. He received a Bachelor of Science degree from Rutgers University and a Doctor of Science degree from Massachusetts Institute of Technology.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**. . . Engineered To the Job**

Name your cable filler. Plymkraft will fill the bill: lightly waxed, heavily waxed or cold wax cable fillers. Wax type is picked to meet your design requirements on moisture resistance, tensile strength, footage and fill capacity.

Pick your putup—up to 12" x 12" tubes—for the most efficient production run. Uniformly treated and twisted Plymkraft fillers come in a wide range from .030" x 7/32" in diameter.

Your Plymouth man can help you choose the cable filler which best meets your requirements and is the most economical and cleanest for your operation. Engineering consultation available for specific problems. Write or call any sales office below.

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P.O. Box 10215
New Orleans, La.
VErnon 5-7243

70 Sacramento St.
San Francisco, Calif.
GArfield 1-4709

750 Bay St.
Toronto, Ont., Canada
EMpire 3-4281

**PLYMKRAFT DIVISION**
Plymouth Cordage Company, Plymouth, Massachusetts


### Sales Mgr. for CF&I at Spokane

**Bert F. Rivers** has been appointed District Sales Manager, Spokane, Wash., for **The Colorado Fuel and Iron Corporation,** it has been announced by **J. T. Brittain,** General Manager of Sales, Pacific Coast Division.

★ ★ ★

**Mr. Rivers,** who is presently Assistant District Sales Manager in San Leandro, California, will replace **M. L. Alter.** Mr. Alter has been appointed Assistant Director of Sales, National Accounts for CF&I and will move to New York City.

### To Manage G.E.'s Silicone Products Department

**Jerome T. Coe** has been named general manager of **General Electric Company's** Silicone Products Department at Waterford, N. Y., effective February 18, 1959, according to an announcement made by **Robert L. Gibson,** vice-president of the company and general manager of the Chemical and Metallurgical Division. Mr. Coe succeeds **Dr. Charles E. Reed** who becomes general manager of General Electric's Metallurgical Products Department.

### Republic Steel Appoints Henke

**Robert H. Henke** has been appointed **Assistant Manager of Republic Steel Corporation's** Central Alloy District at Canton and Massillon, Ohio. He had been Manager of Quality Control at Allegheny Ludlum Steel Corporation's Brackenridge Works since 1952, which company he had joined in 1942.

### Seneca Wire Elects Head

**Announcement** has been made of the election of **John H. McNerney** as Chairman of the Board and chief executive officer of **The Seneca Wire & Manufacturing Company,** Fostoria, Ohio.

## AS&W Appointments

**Two** simultaneous appointments in the Rockefeller Building headquarters of U. S. Steel's **American Steel & Wire Division** have been announced.

★ ★ ★

**Gordon S. Rogers** has been advanced to assistant director, production planning, in charge of methods and procedures for the Division. Succeeding Mr. Rogers as administrative assistant in the Vice President's office, is **David J. George.** Both appointments were effective March 1.

★ ★ ★

**Mr. Rogers** received his B.S. degree in industrial management from the University of Alabama in 1936, and shortly thereafter began his career with the Wire Division as an industrial engineer at the Worcester, Mass., cable works. He held a number of positions and was made administrative assistant in 1955.

★ ★ ★

**Mr. George** attended Penn State College and the University of Pittsburgh. His career with the Wire Division began at the Donora Works in 1940. Advancing rapidly in the industrial engineering department there, he became staff industrial engineer in 1957, the position occupied when he received the present appointment.

## Name Change

**George H. Wheatley,** President of **Century Products Co.,** Detroit, has announced that the company's name has been changed to **Century Dispersions, Inc.,** the more accurately to describe the products it manufactures.

★ ★ ★

**Century** produces color dispersions in paste and chip form, synthetic and natural rubbers for paints in various solutions and for coloring plastic extrusions, and color concentrates for vinyl and polyethylene coloring of wire insulations at the extruding machine.

## 1958 Book of ASTM Standards

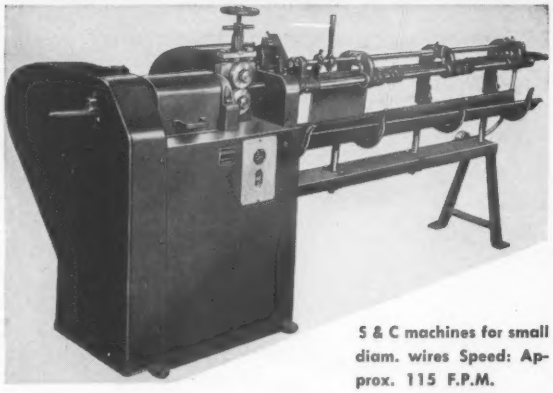
**The** first of 10 parts of the 1958 **Book of ASTM Standards** has recently been published by the Society. This will be followed by other parts as rapidly as editorial, press work and binding can be completed. The first part off the presses was Part 2 on Non-Ferrous Metals. This is to be followed shortly by Part 9 on Plastics, Electrical Insulation, Rubber, and Carbon Black; and Part 4 on Cement, Concrete, Mortars, Road Materials, Waterproofing, and Soils.

★ ★ ★

**The Book of ASTM Standards** is the **American Society for Testing Materials'** largest publication venture and represents one of the main reasons for the Society's existence. Distributed throughout the world, ASTM standards are used to cover the production, purchase, and evaluation of millions of dollars worth of materials annually.

★ ★ ★


# New! Improved! Fast!
# WELLS STRAIGHTENER & CUTTER



S & C machines for small diam. wires Speed: Approx. 115 F.P.M.

**This completely redesigned line combines maximum efficiency with that rugged dependability, for which WELLS S&C machines have become justly famous.**

**Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.**

***FEATURES***

**The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.**

A COMPLETE RANGE OF S & C MACHINES
IS MADE BY WELLS FOR ALL SIZES OF WIRE.
SEND FOR CATALOG ON THE COMPLETE LINE.

*Frank L. Wells Company*

***Builders of Fine Wire Working Machinery***

**5821 FIFTH AVENUE • KENOSHA, WISCONSIN**

**Within** the 10 parts will be contained 2,450 standard specifications, methods of test, definitions of terms, and recommended practices. Each part is complete with a detailed subject index and a list of standards in numeric sequence. Subjects covered in the parts are:

**Part 1** Ferrous Metals Specifications (Except Test Methods)
**Part 2** Non-Ferrous Metals Specifications (Except Test Methods), Electronic Materials
**Part 3** Methods of Test for Metals (Excluding Chemical Analysis)
**Part 4** Cement, Concrete, Mortars, Road Materials, Waterproofing, Soils
**Part 5** Masonry Products, Ceramics, Thermal Insulation, Sandwich and Building Constructions, Acoustical Materials, Fire Tests
**Part 6** Wood, Paper, Adhesives, Shipping Containers, Cellulose, Leather
**Part 7** Petroleum Products, Lubricants, Tank Measurements, Engine Tests
**Part 8** Paint, Naval Stores, Aromatic Hydrocarbons, Coal, Coke, Gaseous Fuels, Engine Anti-freezes
**Part 9** Plastics, Electrical Insulation, Rubber, Carbon Black
**Part 10** Textile, Soap, Water, Atmospheric Analysis, Wax Polishes

★ ★ ★

**The** complete set is priced at $116.00. The set or separate parts may be ordered from ASTM, 1916 Race St., Philadelphia 3, Pa.

## Catalog of Kaiser Aluminum Mill Products

A complete listing and description of Kaiser Aluminum's mill products are contained in a new illustrated 24-page booklet now available from **Kaiser Aluminum & Chemical Sales, Inc.**

★ ★ ★

**General** information, description of characteristics and typical properties are given for the mill products. These include various types of sheet, plate, foil, rod, bar, wire, extrusions, tubing, forgings, billet and pig.

★ ★ ★

**Other** products described are roofing and siding, Shade Screen, process pipe, mining and construction pipe, irrigation tubing, portable cords, bus conductor, building wire, machine tool wire and welding cable.

★ ★ ★

**The** new publication may be obtained free from Kaiser Aluminum & Chemical Sales, Inc., Department NR-19, 919 North Michigan Avenue, Chicago 11, Illinois.

## Opens New Metallurgical Control Laboratory

**The Carpenter Steel Co.**, Reading, Pa., has put into operation a new metallurgical control laboratory to provide faster service in the production testing of steels to customer specifications.

★ ★ ★

**The** new facility enables Carpenter to examine and evaluate steel in manufacture up to five times as fast as was formerly possible, estimates **Dr. Carl B. Post**, vice president and technical director. This speedup in testing time is expected to result in improved quality control and substantially faster delivery on many mill orders.

★ ★ ★

**All** production testing is now


The PESCHEL line

ELECTRICAL TEST EQUIPMENT FOR THE Wire Industry

MODEL H 20 AC/DC

HIPOT EQUIPMENT AND INSULATION TESTERS

**Use economical "H" series** of testers for accurate, non-destructive testing of equipment, components, and materials. Features include high sensitivity and very low corona level. 5 microamp circuit breaker, deenergizes HV. Adjustable, 5 to 5000 microamps. Detects leakage of 200 megohms per KV. Dual output a-c and d-c. Many models to choose from up to 120 KV.

**Free literature sent.** Other dielectric, overvoltage, breakdown, corona, fault counter, continuity, and leakage testers available.

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completely centralized in the new control lab, which is located on the second floor of the wire mill directly above the plant's major point of shipment.

### Booklet on Nickel Alloys for Wire Cloth

**The International Nickel Company, Inc.,** has issued a new booklet entitled "Which Inco Nickel Alloy Can Solve Your Cloth Problem?" The illustrated 15-page booklet is addressed to engineers, designers, and operators of equipment in the many fields which make use of wire cloth for filters, dipping baskets, core-support structures, and other applications.

★ ★ ★

**The** booklet describes the physical advantages of wire cloth and indicates the range of weaves and sizes available for various purposes. Mechanical properties of "A" Nickel, Monel-copper alloy, Inconel nickel-chromium alloy, and Incoly iron-nickel-chromium alloy are given the four standard materials for wire cloth and knitted mesh, along with a listing of the many products commonly filtered through these wire cloth materials. Twenty-three case histories are included.

★ ★ ★

**The** new booklet is available without charge from the Readers Service Section of The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

### Multiple Feed Device Provides Unlimited Spring Length

A multiple wire feed mechanism developed by the Machine Division of **The Torrington Manufacturing Company,** Torrington, Conn., increases the feed length on segment-type coilers, through automatic multiple-stroke feed, so that all the most common long springs can be coiled accurately and rapidly to any desired length. Retaining the use of pitch, diameter and cutter mechanisms and the inherent accuracy of segment-type coilers, compression and extension springs (open or close-wound) with plain, squared, tapered and coned-down ends can be produced up to twice as fast as a clutch-type coiler of equivalent size.

★ ★ ★

**The** multiple wire feed mechanism can be used with any set of extra wire feed gears that can be mounted on the basic machine. Standard cams can be used and, when a spring is being set up or adjusted, only that portion requiring camming need be coiled. A substantial saving in wire during set-up can result, particularly on longer springs. Long torsion springs can be produced by use of an internal support rod.

★ ★ ★

**Full** details may be secured by writing the company.


You Are Invited To Join

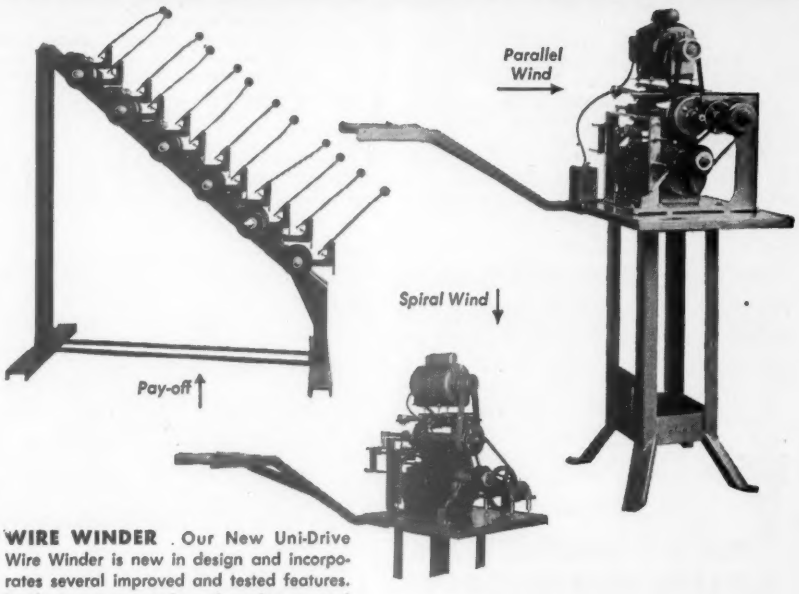
**THE WIRE ASSOCIATION**

Send for booklet describing its activities and a membership application card.

453 Main St. Stamford, Conn.



**STANDARD UNI-DRIVE WIRE WINDER**




**WIRE WINDER** . Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

*Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.*

**PAY-OFF** Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

**STANDARD MILL SUPPLY COMPANY**
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

# A Review of Recent Wire Patents

**The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.**

**Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.**

No. 2,871,752, SCREW HAVING A DRILL POINT AND SERRATED CUTTING EDGE, patented February 3, 1959 by William Stern, Park Ridge, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

The point of the screw is provided with a chip-deflecting recess surface and a surface to facilitate a work-penetration.

★ ★ ★

No. 2,871,923, SPRING STRUCTURE, patented February 3, 1959 by Maurice Stubnitz and Lewis J. Stern, Adrian, Mich., assignors to Stubnitz Greene Corporation, Adrian, Mich., a corporation of Michigan.

A stringer type spring wire element is provided for vehicle seats and the like comprising a linear spring portion in the form of a relatively straight wire portion, a jack spring portion integral with the linear spring portion and disposed at one end thereof in off-set relation thereto, the wire of the jack spring portion being of circular cross section and at least a part of the straight wire portion being of flattened cross section. There are 11 claims.

★ ★ ★

No. 2,872,023, FLAT WIRE CONVEYOR BELT, patented February 3, 1959 by Alfred R. Bechtel, Jr., Portsmouth, R. I., assignor to Ashworth Bros., Inc., Fall River, Mass., a corporation of Massachusetts.

A flat wire conveyor belt is disclosed, operable in a path transversely curved in the plane of the belt and having continuous transverse tractive links and pivotal tractive cross-pins formed for maintaining traction at the outer and convex edge portion only of a belt following a path transversely curved in the plane of the belt, while the portions of the links adjacent the inner and concave edge of the belt are free to relatively approach each other.

★ ★ ★

No. 2,872,027, APPARATUS FOR APPLYING LUBRICANT TO WIRE, patented February 3, 1959 by William H. Johns, Gates Mills, and Arthur A. Perry, Cleveland, Ohio, assignors to United States Steel Corporation, a corporation of New Jersey.

An open end cylinder adapted to contain wire-drawing lubricant is rotatably mounted in a die-mounting frame longitudinally of the entrance end of the die, with a device mounted on the frame and connected with the cylinder for rotating the latter, the mounting of the cylinder being such as to cause the axis of rotation thereof to be offset from the axis of the wire-drawing die.

★ ★ ★

No. 2,873,515, COIL INSERTER, patented February 17, 1959 by Bertil G. Winstrom, Thiensville, Wis., assignor to A. O. Smith Corporation, Milwaukee, Wis., a corporation of New York.

This device is for mechanically inserting prewound wire windings into slots extendng in the inner periphery of an annular core.

★ ★ ★

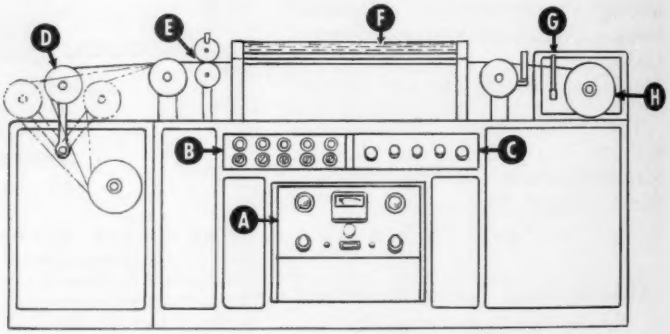
No. 2,873,518, WIRE ELECTRODE FOR ELECTRIC DISCHARGE LAMPS, patented February 17, 1959 by Werner Schilling, Heidenheim (Brenz), Siegfried Bahrs, Berlin, and Hans Wiedenmann, Heidenheim (Brenz), Germany, assignors to Patent-Treuhand-


**NEWLY DESIGNED AND ENGINEERED TO INCREASE YOUR PRODUCTION EFFICIENCY . . . THE**

## ENJACO BENCH RE-SPOOLER

**COMBINATION "D"**

**FOR RE-SPOOLING, SPARK TESTING AND MEASURING WIRE UP TO 3/16" DIAMETER**




Keeping pace with the industry's need for ever-superior equipment, Enjaco has developed the Bench Re-spooler for re-spooling Teflon and small sizes of lightly insulated or easily damaged wire. The machine is 96" long (with optional patching press, 114"), 44" high and 32" deep, and features compact, centralized control panels. A. 5 KV Spark Tester with automatic power controlled to 10 MA short circuit current at all testing voltages . . . B. Electronic Counter Control . . . C. Re-spooling Control . . . D. Automatic Tension Pay-off . . . E. Accurate Electronic Counter (will not mark or damage wire) . . . F. Bead-Chain Electrode . . . G. Variable-speed, variable-width Traverse driven from reel shaft . . . and H. Re-spooler for up to 12" spools, variable speed, with torque-controlled motor.

**ASK FOR CATALOG SECTION 2D-4**

ENJACO CORPORATION

**JAMES L. ENTWISTLE**
*President*

**THOMAS L. HOLMES**
*Vice President*

**100 GLEN ROAD, CRANSTON 10, R. I., U.S.A.**
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**CABLE "JALENCO" PROVIDENCE**

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*Station Works-Bury Road*
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**WESTERN REPRESENTATIVES:**
*Paul I. Kenner Co.*
*230 Shaw Road*
*South San Francisco, Cal.*

Gesellschaft fur Elektrische Gluhlampen m.b. H., Munich, Germany.

A method of manufacturing a wire electrode is disclosed including sintering metallic powders of tungsten or molybdenum to produce a rod or wire, reducing and elongating the wire to produce a fiber structure of the wire crystals parallel to the longitudinal axis of the wire distorting the wire along its longitudinal axis at a simultaneous heating up to 250° C. so that the outer fibers of the wire are running against its axis within an angle of 15 to 70° whereby cracks and spaces are formed by separation of the crystal fibers on the wire surface over its whole length, thereby forming a rough surface to which the emission material can well adhere.

★ ★ ★

No. 2,873,635, BENDING TOOL FOR WIRE ROD HANGERS, patented February 17, 1959 by Gerald T. Waldron, Roanoke, Va.

More specifically, the tool is adapted for bending the free end of a wire rod hanger into a U-shaped configuration to receive a ceiling-supporting channel disposed with the web in a vertical position.

★ ★ ★

No. 2,873,767, MACHINE FOR MAKING SPRING CLIP CLOTHESPINS, patented February 17, 1959 by Leslie W. Barnes, Trumbull, Conn., assignor to Forster Mfg. Co., Farmington, Maine, a corporation of Maine.

The wire spring is formed and then attached to the wooden clothespin jaws. There are 10 claims.

★ ★ ★

No. 2,873,768, WIRE SHAPING MACHINE, patented February 17, 1959, by Edward L. Bronstein, Jr., St. Paul, and Richard A. Fisher, Golden Valley, Minn., assignors to The United States Bedding Co., St. Paul, Minn., a corporation of Minnesota.

More specifically, the machine is adapted for bending and coiling wire for producing stabilizers of hexagonal shape for inner spring units, such as disclosed in the Martin patent 2,509,831.

★ ★ ★

No. 2,873,788, FILAMENT COILING MACHINE HAVING FINELY ADJUSTABLE COILING HEAD, patented February 17, 1959 by William Arthur Fletcher, Grand Rapids, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware.

In a filament coiling machine of the type having a rotatable coiling head, a drive train for imparting intermittent rotation to the coiling head, and a guide for placing filament wire upon the coiling head, the inventor provides a resilient coupling interposed between the coiling head and the drive train for transmitting rotation to the coiling head in one direction only.

★ ★ ★

No. 2,873,803, APPARATUS FOR TREATING STRIP AND THE LIKE, patented February 17, 1959 by Albert J. Sarka, Maple Heights, Ohio, assignor to Wean Equipment Corporation, Cleveland, Ohio, a corporation of Ohio.

There are 13 claims for apparatus for treating rapidly moving strip including a release device in the continuously operable mechanism whereby the strip material may be drawn freely through the feeding mechanism at a speed greater than the rate of feed. There is also retarding means acting on the continuously operable mechanism to limit free rotation of the continuously operable mechanism.

★ ★ ★

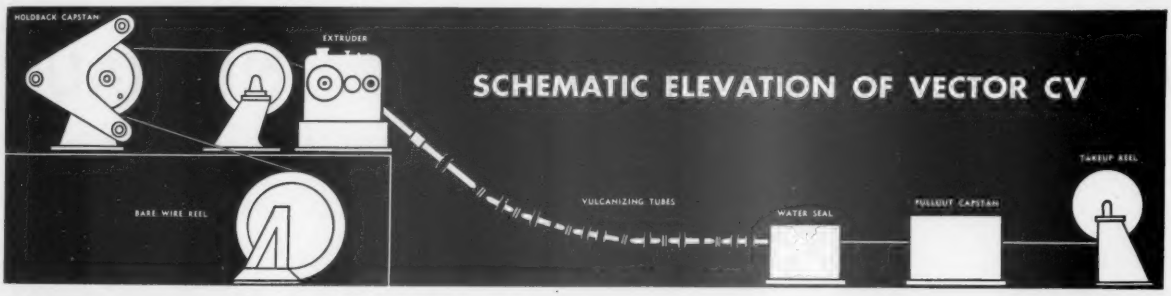
No. 2,873,924, COIL WINDING METHOD AND APPARATUS, patented February 17, 1959 by Robert Charles Glazier, Hayward, and Gottfried Zickler, Castro Valley, Calif., assignors to Friden, Inc., a corporation of California.

More specifically the method is for alternately applying wire from a number of wire supplies to a rotating support and repeating the applications without in any case severing the wire supplied.

★ ★ ★

No. 2,874,603, NAIL WITH FRANGIBLE EXTENSION, patented February 24, 1959 by William A. Boettcher, Chicago, Ill.

A wire nail is provided, having a frangible portion integrally connecting an extension body to the upper portion of the head of the nail. This frangible portion includes an annular centrally arranged frusto-conical portion converging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- **COMPLETE** electrical control.

***NEW:*** **- "CONSTANT PRESSURE" ROLLER HOPPER**

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Downey, Cal. — H. M. Royal, Inc. — TOpaz 1-0371

Tokyo, Japan — Okura Trading Co., Ltd. — (56) 2130 - 2149

axially from the extension body into the head of the nail, and diametrically opposed web portions extending laterally from and integral with the frustoconical portion and frangibly integral with an upper surface portion of the nail head.

★ ★ ★

No. 2,874,731, WIRE FORMING APPARATUS, patented February 24, 1959 by Clarence J. Smith, Rockford, Ill., assignor, by mesne assignments, to W. F. and John Barnes Company, Rockford, Ill., a corporation of Illinois.

A power operated apparatus for forming tire inserts from zig-zag wire stock having transverse sections disposed in a common plane while the stock is moving continuously along a path of travel, is disclosed.

★ ★ ★

No. 2,874,916, COIL HOLDER, patented February 24, 1959 by Arthur S. Wallin, Chicago, Ill., assignor to Hydrometals Inc., Chicago, Ill., a corporation of Illinois.

A coil of sheet metal is rotatably supported, with power means for rotationally driving the supporting means to unwind the coil, and a device controlled by current conduction through and responsive to the length of a slack loop in the outer layer of the coil for automatically deenergizing and energizing the power means to thereby maintain such outer layer loose with freedom to shift laterally.

TITANIUM MILL PRODUCTS: PRODUCTION AND SHIPMENTS, DECEMBER AND NOVEMBER 1958

(Pounds)

| Product | Production[1] | |
|---|---|---|
| | December 1958 | November 1958 |
| TITANIUM MILL PRODUCTS, TOTAL... | 517,508 | 424,558 |
| Sheet, plate, and strip[2]..... | 226,209 | 245,415 |
| Forging and extrusion billet..... | 193,474 | 69,819 |
| Rod, bar, and wire..... | 97,825 | 109,324 |

[1]For each product, shipments were equal to production.
[2]Includes small quantities of pipe, tubing, and extrusions to avoid approximately disclosing the operations of individual companies.

## Study of Corona On Polyethylene

**E. I. du Pont de Nemours & Co.,** Wilmington 98, Del., has helped to remove one of the last remaining mysteries confronting the engineer who designs electric wire and cable insulated with polyethylene.

★ ★ ★

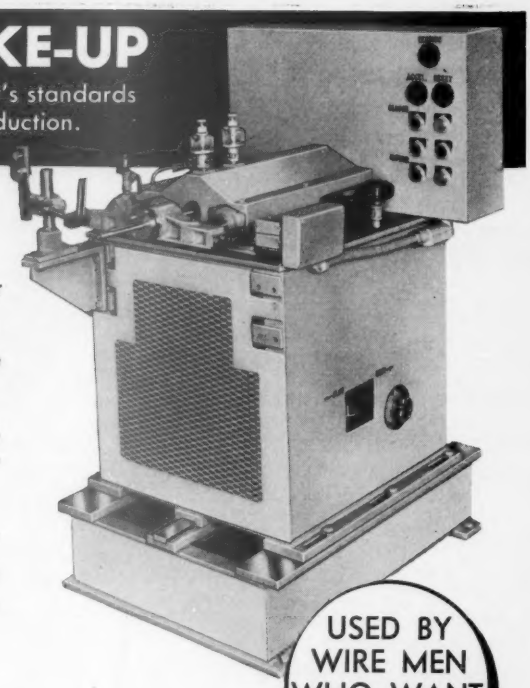
A laboratory report, based on 200,000 sample exposure hours, provides the industry with guideposts for designing polyethylene insulation that is free from the effects of corona.

★ ★ ★

To satisfy requests for copies, du Pont has had the report prepared in booklet form, copies of which are available. To the original report the company has added some entirely new research results, which start on page 23.

# Sjogren FLAT WIRE TAKE-UP

This new SJOGREN machine is designed to meet today's standards for trouble-free operation and long-run wire mill production.



FEATURES INCLUDE:

**SPEED** — Presently running 650 fpm.

**CAPACITY** — 25 pound maximum capacity spool. (Similar models for heavier capacity).

**TRAVERSE** — Hydraulic spool traverse is infinitely adjustable from zero to 5/8" per rpm of spool.

**TENSION** — When placed directly behind flattening mill, constant tension is maintained through a Louis-Allis eddy current clutch type motor.

**STARTING** — Forced acceleration circuit prevents slack wire.

**BASE** — Machined so that top unit may be moved to compensate for wear on the flattening mill roll.

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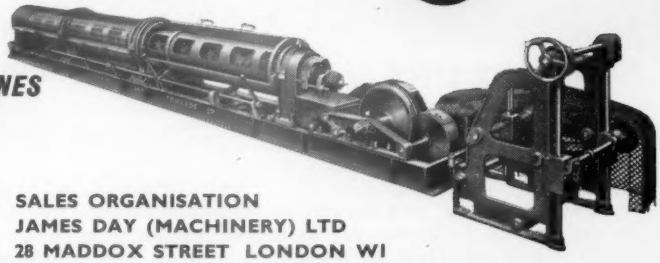
. . . indicate a world-wide reputation. Hanson & Edwards have supplied High Speed Tubular Stranding Machines to many of the most important Wire Rope and Cable factories throughout the world. These machines have rotors which run in large SPLIT ROLLER BEARINGS, not on support rollers, giving higher speeds, smoother running and lower maintenance costs

***ROLLER BEARING TYPE HIGH SPEED TUBULAR STRANDING MACHINES***

*Made in various sizes for reels from 5" x 2½" up to 24" x 12" Write now for details*



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ALUMINUM INGOT AND MILL PRODUCTS AND MAGNESIUM MILL PRODUCTS: DECEMBER 1958

(Shipments and receipts are in thousands of pounds)

| Item | Number of companies reporting shipments | December 1958 | | | November 1958* net shipments | December 1957* net shipments |
|---|---|---|---|---|---|---|
| | | Gross[1] shipments | Receipts[2] | Net[3] shipments | | |
| ALUMINUM PIG AND INGOT, TOTAL | 88 | 200,386 | 104,115 | 96,271 | 86,170 | 112,529 |
| ALUMINUM MILL PRODUCTS, TOTAL | 152 | 260,532 | 24,513 | 236,019 | 216,249 | 177,701 |
| Sheet and plate, non-heat-treatable | 27 | 102,436 | 19,951 | 82,485 | 78,569 | 59,554 |
| Sheet and plate, heat-treatable | 4 | (D) | (D) | 20,876 | 17,717 | 13,597 |
| Foil, including foil in lamination | 13 | (D) | (D) | 18,308 | 18,205 | 16,870 |
| Rolled, and continuous cast, rod and bar[4] | 6 | 12,323 | 3,518 | 8,805 | 6,499 | 6,032 |
| Wire, bare, conductor and nonconductor | 15 | 4,699 | 291 | 4,408 | 3,788 | 3,338 |
| ACSR and aluminum cable, bare | 11 | (D) | (D) | 16,516 | 9,486 | 14,113 |
| Wire and cable, insulated or covered | 14 | 5,380 | ... | 5,380 | 4,497 | 3,950 |
| Extruded shapes, soft alloys | 97 | 60,907 | 670 | 60,237 | 61,751 | 46,885 |
| Extruded shapes, hard alloys | 8 | 6,422 | ... | 6,422 | 4,043 | 2,823 |
| Drawn tube, soft alloys | 13 | 4,832 | ... | 4,832 | 4,420 | 4,035 |
| Drawn tube, hard alloys | | | | | | |
| Welded tube, non-heat-treatable | 7 | 1,861 | ... | 1,861 | 1,452 | 672 |
| Powder and paste: | | | | | | |
| Atomized and grained powder | 3 | 545 | ... | 545 | 521 | 524 |
| Flaked powder | 5 | 279 | ... | 279 | 300 | 259 |
| Paste | 5 | 982 | ... | 982 | 902 | 697 |
| Forgings (including impact extrusions) | 14 | 4,083 | ... | 4,083 | 4,099 | 4,352 |
| MAGNESIUM MILL PRODUCTS, TOTAL | 10 | (D) | (D) | 1,622 | 1,660 | 1,102 |

*Revised.

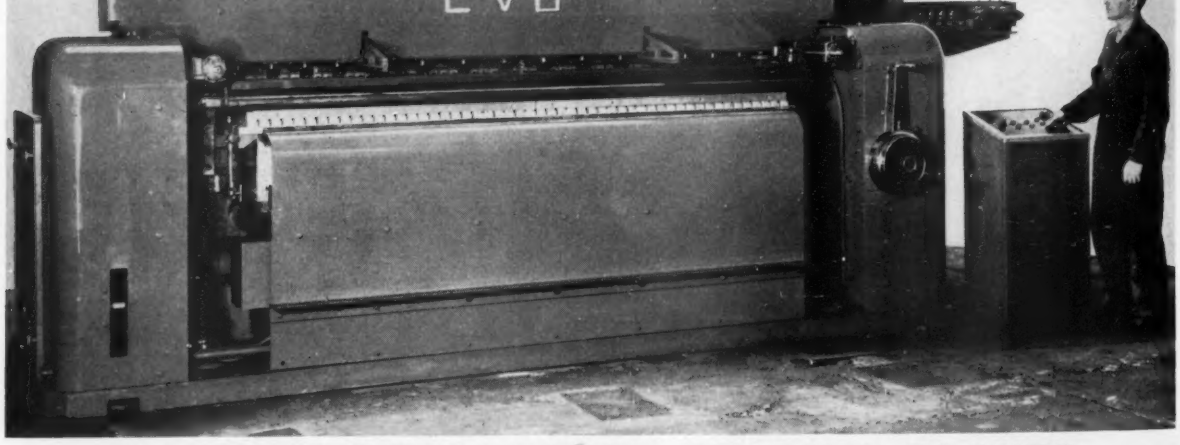
D Withheld to avoid disclosing figures of individual companies. These figures are included, however, in the appropriate total.

[1]Gross shipments of mill products represent total shipments by producers to customers, including other producers, and shipments by producers to their own fabricating departments which manufacture products beyond the level of mill shapes. Ingot gross shipments include shipments by importers.

[2]For mill products, represents receipts from domestic producers only. In addition to receipts from domestic producers, 140,000 pounds of mill shapes were received through imports. For ingot, receipts from imports are included.

[3]For mill products, derived by subtracting the sum of producer's domestic receipts of each mill shape from the industry's gross shipments of that shape. Ingot data derived by subtracting all receipts from shipments reported.

[4]Includes a small amount of rolled structural shapes.


# TAILORED WIRE FABRIC WELDING PLANTS

## *Now Available in U.S.A.*

Bringing tremendous advantages over other welders, EVG's line of wire fabric welding plants offers increased versatility and profit to American mesh manufacturers. (Shown in photograph above is EVG's Standard Duty model G5 with a working range of 4/0 to 10 gauge.) All EVG wire fabric welding plants feature the latest type automatic feeding, straightening and cutting devices, full electronic controls and adjustments for pressure, heat and dwell. Fabric changeover is economic and speedy. Available in five base models—fine-wire, light, standard, medium and heavy-duty. No waste capacity—great savings in capital investment and floor space reduction.

***Available for inspection in actual production in U.S.A. and Canada. Direct inquiries to Richard E. Kleinhans, 122 East 42nd Street, New York, New York, OXford 7-0770.***

## Drive Systems for High Speed Tandem Wire Flattening Mills

(*Continued from page* 442)

now sets wire tension. As a result, excellent tension control is accomplished down to the smallest wire sizes.

★ ★ ★

**Except** for reversed polarities and senses, the above description applies equally well for either payoff or take-up reels. In addition to the basic circuitry, additional features such as inertia compensation, stalled tension, reel jogging and positioning, emergency stopping, and reel loading and unloading control are provided.

### Summary

In this article we have briefly described the electrical drive systems used on many modern wire flattening mill installations. With the increased emphasis on automation, there is every reason to expect that more and more of the manual functions will be performed automatically in keeping with the ultimate desire to produce a better product, faster, and at a lower cost. To dream a bit, it is interesting to visualize tomorrow's wire flattening mill which might incorporate such features as completely programmed operation with automatic screwdowns and gage control, automatic threading, and automatic loading and unloading.

★ ★ ★

**With** the increasing need for more and better flat wire products, the extent of automation as applied to wire flattening mills can only be limited by the imagination and courage of those persons making up the industry.

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**THE WIRE ASSOCIATION**

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**EXPENDABLE REELS**

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ADVANTAGES
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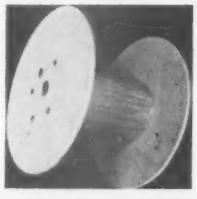
- Size and specification flexibility



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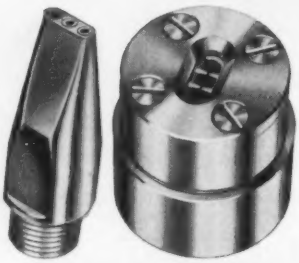
# INSULATING DIES AND NOZZLES
*for*
## EXTRA-HIGH ELECTRIC WIRE PRODUCTION

### CARBIDE AND STEEL



CARBIDE EXTRUSION NOZZLES OR TIPS FOR ALL MACHINES.

Highest quality of workmanship and materials. Standard Types and Special Dies and Tips to your order.

CENTRAL CARBIDE NOZZLES have phenomenally long life; will lower operating costs and reduce wire breakage.

CENTRAL STEEL DIES are made in Round, Figure 8, Serrated, Tracer, and other special shapes to your specifications.

A newly designed Tru-Rip Die Assembly can be taken apart, cleaned, blades changed, and the whole reassembled easily and quickly. Made for 2 and 3 conductor wires to be coated in extrusion machines.

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For this you pay a little more in first cost, but you save in faster work, in superior die finish and in better wire drawn. DANFORTH POWDERS are uniform in purity, quality, grain shape and accuracy of grading.

**COMPLETE RECLAIMING SERVICE**

**The DANFORTH PROCESS of reclaiming produces powders that are *guaranteed* to be 99% or better pure.**

***Write today for information on diamond powders.***

**C. W. DANFORTH COMPANY**

**101 E. Indianola Ave.** Established in 1912 **Youngstown 7, Ohio**


## A Compound System for Wire Drawing Machines

(*Continued from page* 460)

is bolted on, but which can be slid to one side on a rail when the bolts are removed. A 2″ full-flow ball valve is provided on each cover plate to permit removal of residual liquid compound before opening the covers to remove the sludge. Liquid thus removed is first conveyed to the first floor in the same manner as the sludge, except that on the first floor it is then pumped from the drums into special portable 1000-gallon disposal tanks which when full are towed to the shipping platform for disposal by a contract scavenger. The tanks used are of a special design which can be picked directly off the loading dock by hoist equipment on the contractor's truck. The material is then hauled to the contractor's dump where the tank is emptied and returned. This procedure is utilized only for the small amount of residual liquid which remains on top of the sludge after the bulk of it has been pumped over to adjacent tanks as described earlier. The heavy sludge is sold by bid to commercial reclaimers for its copper content.

★ ★ ★

**The** facilities for the handling of paste concentrate and making up the operating compound were chosen and installed with simplicity of operation and minimum physical effort as prime objectives. 55-gallon drums of paste compound are lowered into the mixing room by means of a bridge crane and electric hoist from the first floor. An operating supply of about 12 drums can be stored in the mixing room. A small drum-handling truck (manually propelled electric lift) is used for lifting and moving drums in this room and is used to position the drums on a drum tilter from which they are emptied into the mixing tank. The tank has a nominal capacity of 1000 gallons and is recessed in the floor so that the top surface is one foot above the floor level for ease of loading. Agitation is provided by means of a 100 GPM recirculating pump which also serves to pump the compound to the operating tanks. Since both the No. 1 and No. 2 machines

utilize the same type of paste compound, only one mixing tank is required for both systems. The compound is heated by means of a steam pipe exhausting beneath the surface of the liquid.

★ ★ ★

**The** level of the compound in the operating tanks can be quickly checked by means of level indicator gages on the first floor. The level indicators are of the bubbler rather than the float type in order to eliminate the possibility of mechanical malfunctioning. Low pressure air is continuously bubbled through the tank at a carefully controlled rate, the pressure required being an indication of the tank level. Low pressure gages calibrated in inches show the tank level directly.

★ ★ ★

**As** would be expected, a six foot wide tunnel between two rows of tanks at temperatures in excess of 120 degrees tends to become quite warm. In the design of the ventilating system, the objective was to provide adequate protection for the pump motors as well as comfort for personnel without undue blasting. An exhaust manifold runs the entire length of the tunnel and into the mixing room, with ducts into each tank. Warm air and tank vapors are drawn into the ducts, drawing air from the tunnel through openings in the tank walls to provide ventilation for the pump motors. The air in the tunnel is replenished by air from the first floor, which is drawn down the stairway at one end of the tunnel and through a safety hatch at the other end. An 11,000 CFM blower draws one change of air approximately every minute through each tank.

★ ★ ★

**Although** minor modifications have been made and are still being made to this installation, our experience to date has indicated that the major design objectives have been realized. We believe that reliability has been combined with sufficient versatility to enable the system to keep pace with any future changes in conductor or improvement in compound.


# NOTICE OF MEETING
of the
# BOARD OF DIRECTORS

The Board of Directors of The Wire Association will hold its regular Spring meeting at 9:30 A.M., on Tuesday, April 28, 1959, at the Biltmore Hotel, New York City.

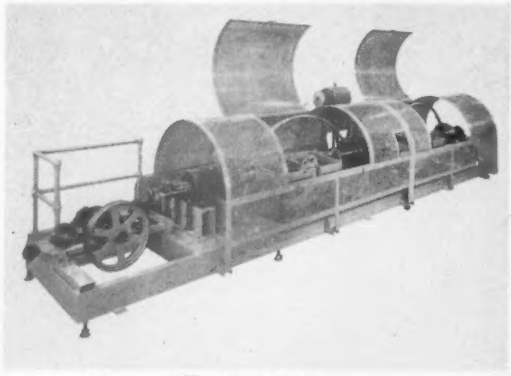
Those directors coming from out of town arriving in the city the day before may make their own reservations direct with The Biltmore.

**THE WIRE ASSOCIATION**

**Richard E. Brown, *Executive Secretary***

**453 MAIN STREET • STAMFORD, CONN.**





3-Wire Plain Twister

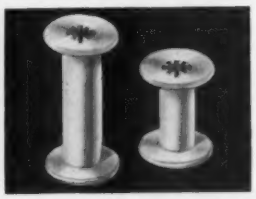
| | |
|---|---|
| **High Production** | **1000 or 1140 twists per minute** |
| **Low Power Consumption** | **5 H. P.** |
| **High Efficiency** | **87% to 92% on a 24 hour basis.** |
| **Extremely Versatile** | **Will twist a large variety of conductors.** |

This type machine made to handle reels 24 and 30 inches in diameter—Heavier and slower machines handle reels 36 and 48 inches in diameter.

*Write for further information on this low cost machine.*

**THE EDMANDS CO.** **860 WELLINGTON AVE. CRANSTON 10, R. I.**

# PLAMENCO Nylon SPOOLS



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**WIRE SPOOLS**

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## New Cellulosic Plastic Finish Improves Life and Appearance of Fabricated Wire Products

(*Continued from page* 461)

**The** finishes are applied in a range of attractive colors providing a surface of controlled sheen from high gloss to satin finish. Corvel cellulosic resins have outstanding color and gloss retention when exposed to water and sunlight.

★ ★ ★

**Parts** coated with the durable new finish eliminate the problem of rusting and the need for repainting prepared surfaces, as the coating does not easily stain, chip, peel or mar. It is highly resistant to most detergents and greases.

★ ★ ★

**In** industrial applications, the coating provides a generally good protective finish with excellent toughness, impact and abrasion resistance. It resists many chemicals and serves also as a good general purpose, low frequency insulator.

★ ★ ★

**This** coating process is the first of its kind introduced by an American firm. Other Corvel resin powders have been used with this coating process, which include vinyls, epoxies, nylon, polyethylene and chlorinated polyether powders.

★ ★ ★

**Wire** fabricated assemblies have strength, rigidity and dimensional stability that is impossible to achieve in all-plastic items. On the other hand, cellulosic finishes add chemical and corrosion resistance, color effects, electrical resistance, surface resilience and warmth of feel not inherent in the uncoated wire.


TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St., Stamford, Conn.

## Torsional Strength of Small-Diameter Wire

(*Continued from page 467*)

pered wire has relatively uniform grains of tempered martensite. As recrystallization has taken place, the inherent planes of weakness have been removed, and the grains are more resistant to torsional fatigue stressing.

★ ★ ★

**The** same stress vs. cycles-to-cracking relationship was determined for the straight-wire specimens of the three different types of wire. Excellent correlation was found in the results of the two test methods, with the spring specimens giving a slightly better performance than the straight wire. This behavior is ascribed to the beneficial residual stress set up in the springs by the pre-setting operation.

★ ★ ★

**Little** correlation was found between the known tensile strength and the torsional fatigue properties of the various wire specimens. In fact, the oil-tempered wire showed the highest resistance to crack initiation, although its tensile strength is the lowest of the three types tested.

★ ★ ★

**To** evaluate the effects of shot peening, both the straight-wire specimens and the springs were given a 30-min. treatment with a 0.009-in. diameter shot, and then were stress-relieved at 450°F for 30 min. In all cases, shot peening increased significantly the fatigue life of the specimens when they were subsequently stressed in torsion. This result is attributed to the highly cold-worked surface layers and the multiplicity of round-bottomed stress raisers or dents caused by the shot peening. These dents along the wire surface tend to distribute the applied stress, thus reducing the effect of any single stress raiser that may have been caused by die marks or imperfections formed during wire fabrication.

### References

1. For further technical details, see

**PEAK PERFORMANCE with**

**PERMAG**

**DRAWING COMPOUNDS**

Over thirty years of successful experience with leading wire manufacturers provide the greatest assurance of better production with PERMAG wire drawing compounds.

Formulated in the Magnuson laboratories for guaranteed peak performance, PERMAG compounds consistently prove themselves ideal for all types of wire drawing, for both production and economy.

FOR WIRE CLEANING, too, PERMAG offers a group of completely tested formulas that will eliminate pickling trouble and speed drawing production.

A Magnuson representative will be glad to demonstrate the proven superiority of PERMAG cleaning compounds. Or, if you wish, a letter will bring you a complete analysis of your problem, without obligation.

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**The Completely NEW Robert J. Emory SPOOLER**

1. Automated—Multi-Spindle
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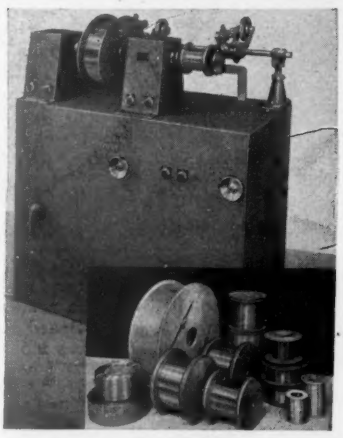
4. Automatic traverse start with either or all winding heads
5. Controlled acceleration rate
6. Jogging of individual winding heads
7. Provision for each winding spindle to stop when wire breaks
8. Full spool detector on each spindle

The New Model 1900-HVE Multi-Spindle Spooler (up to 16 Heads), engineered to include a variable speed system for adjustment of spindle speed, pitch, and traverse. This complete flexibility of adjustment makes a very uniform layer wound package which prevents binding and kinking during pay-off.

The 1900-HVE Spooler is a ruggedly built machine, using precision ball bearings at all rotating members. The adjustments are repeatable, and easily made while the machine is running. It is completely adaptable to the changing demands of the wire industry. A speed range of 18 to 1 is available. It contains the knowledge and experience of over 60 years of wire machine building.

Your special requirements can be incorporated in the design.

You are invited to consult us on your wire spooling problems. Our engineering resources and years of experience are at your service. Emory Winding Machines have been the standard of the industry. Most every major plant has Emory equipment.



SPECIFICATIONS

Size Range: .010" to .080" or heavier if soft, and many flat wire sizes. Max. Spool Size: 16" flange diam. Capacity: Usually 2 to 6 spindles.

**ROBERT J. EMORY COMPANY**
31 East Runyon Street Newark 5, N. J.

HEAVY COIL WRAPPING MADE EASY
WITH LARMUTH'S NEW 12" MACHINE

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WITH PATENT MECHANICAL LOADING AND EJECTION

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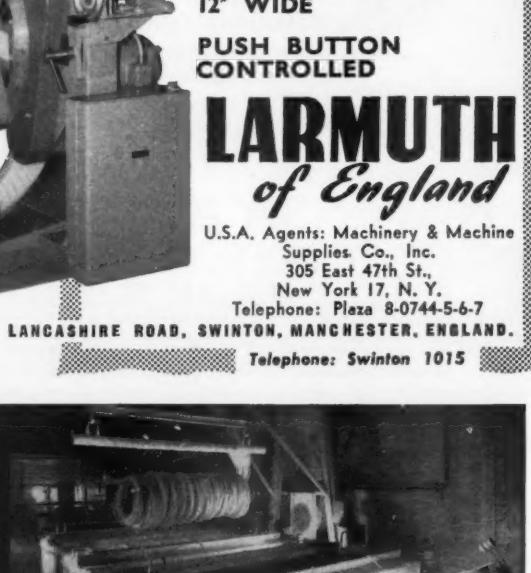
HI-SPEED
REGISTERED
ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

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Atlas Steel Co.
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Crucible Steel Co. of America
Driver-Harris Co.
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Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

Write for Bulletin No. 350

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2,235,559
Canada 396,144
401,589

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20800 CENTER RIDGE RD., CLEVELAND 16, OHIO
OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

Torsional fatigue properties of small diameter high carbon steel wire, by H. C. Burnett, Trans. ASTM, Preprint No. 70 (1958).

2. Endurance of helical springs related to the properties of the wire, by H. C. Burnett and C. L. Staugaitis, Metal Progress, 64, 77 (1953), and The behavior of long helical springs under fluctuating load, ibid., Proc. ASTM, 55, 918 (1955).
3. Fatigue properties of music wire and springs, NBS Tech. News Bul., 38, 37, (1954), and Fatigue testing machine for spring wire, ibid., 41, 63 (1957).

## Teflon 100X Wire and Cable Insulation: Its Place in the Fluorocarbon Family

(*Continued from page* 456)

carbon insulating materials, each channelled into applications best suited to its individual properties, may well form the basis of all truly reliable wire and cable, whether directed to aircraft, electronic, or heavy industrial applications.

### References

1. MIL-W-12349 (Sig C), 25 November 1952, and Amendment No. 1, dated 7 May 1953, "Wire, Hookup, Monochlorotrifluoroethylene Insulated."
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3. R. S. Mallouk and W. B. Thompson, SPE Journal, 14, 10, p. 42 (1958).
4. R. S. Lovett and R. E. Stabler, Wire and Wire Products, 33, 10, p. 1192 (1958).
5. J. J. Ondrejcin, Wire and Wire Products, 30, 7, p. 776 (1955).
6. MIL-H-3136 (NAVY) 16 February 1950: Superseding AN-F-42c dated 2 January 1948 Army 2-128, 4 December 1946: "Hydrocarbon-fluid, Standard Test."

TO WIRE MILL MEN

Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.

★ ★ ★

THE WIRE ASSOCIATION
453 Main Street
Stamford, Conn.

## Soldering Chromel and Alumel Wires

(*Continued from page 469*)

sions.

★ ★ ★

**Wire** conductors for thermoelectric current are readily identified by Convair workers because they have white insulation if made from chromel, or green insulation if made from alumel, and connections are made to instrument contacts which for obvious reasons bear the letters "CH" and "AL."

★ ★ ★

A given length of insulated chromel-alumel wire is readied for assembly with an appropriate contact by using a knife to peel a 1" length of jacket and duplex insulation from its end, and thus to expose color-coded insulation on chromel and alumel conductors. Then the conductors are separated and about ¼" of the insulation remaining on the end of each is removed with properly-adjusted wire strippers.

★ ★ ★

**Alumel** and chromel wires thus bared are next carefully cleaned with a solvent, and aligned with contacts (which have also been solvent cleaned) on a soldering block or steel cover which has a stud to maintain terminal alignment.

★ ★ ★

**Wet** asbestos is wrapped around insulation adjacent to wire areas that must be soldered, and also around assembled instrument components in some instances, to prevent heat damage when terminals are torch heated.

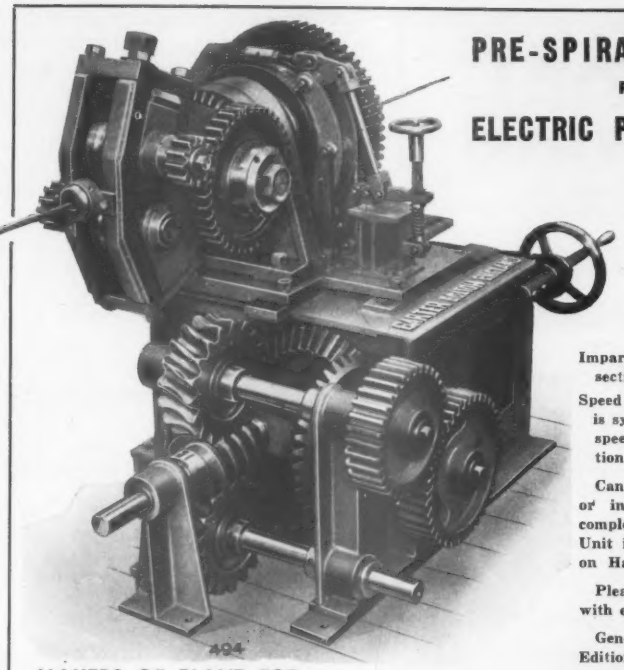
★ ★ ★

**Flux** is uniformly applied around the circumference of each wire bared for soldering and heating is subsequently done with a single-tip, low-velocity, sharply-reduced flame.

★ ★ ★

**Heat** is first evenly applied from the side of a joint so as to convert flux into a clear liquid, and particular care is taken not to aim the flame directly into the inserts.

★ ★ ★

PRE-SPIRALING HEAD
FOR
ELECTRIC POWER CABLE

Imparts a spiral of shaped section to stranded cores.

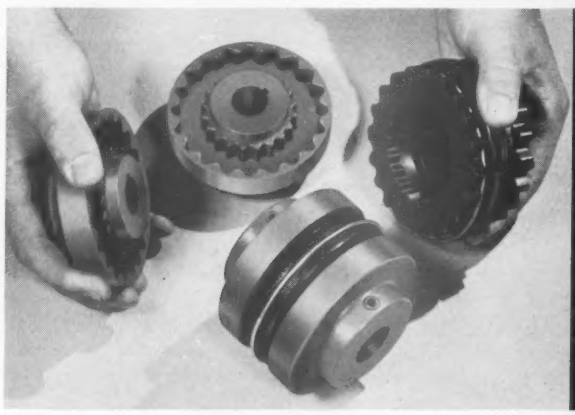
Speed of shaping rollers is synchronized with linear speed of strand by a friction compensator.

Can be supplied as a Unit or in conjunction with a complete Stranding Machine. Unit is driven, reducing load on Haul-off Capstan.

Please send full details with enquiry.

General Catalogue, 5th Edition, available.

MAKERS OF PLANT FOR
ELECTRIC CABLE, BRAIDING and WIRE ROPE
B. & F. CARTER & CO., LTD.
BOLTON, ENGLAND. TELEGRAMS: "BRAIDERS BOLTON"



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A "SURE-CURE" FOR SHOCK VIBRATION SHAFT MISALIGNMENT

Unique design and 4-way flexing action enable Wood's "Sure-Flex" Couplings not only to absorb all types and combinations of angular and parallel misalignment and end-float . . . but from 5 to 15 times more shock and vibration than other leading flexible couplings. There are only four basic parts which lock together without clamps or screws, tightening securely under torque to provide smooth, dependable power transmission. There is no metal-to-metal contact, no wear, no need for lubrication or maintenance. "Sure-Flex" Couplings are easily installed, unaffected by abrasives, dirt or moisture. Operation is noiseless. Get all of the facts.

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The Standard of the Wire Industry


After the flux becomes a clear liquid, solder is handfed into a joint and the flame is withdrawn slightly to assure a firm application of the metal.

★ ★ ★

The solder is allowed to solidify before the resultant assembly is handled. Then residual flux is removed by dipping the joint in warm water and scrubbing it with a fiber bristle brush.

## Bulletin on Vinyl Compounds

**The Blane Corporation,** Canton, Mass., has issued a 4-page bulletin describing the company's products and services.

★ ★ ★

It covers their vinyl extrusion compounds, custom compound service and color concentrates. A copy will be mailed by Blane upon request.

## Vinyl Compound to Conduct Electricity

**Most** people think of vinyl compounds in terms of its dielectric properties, but one has been developed that is an electric conductor.

★ ★ ★

**This** development has been brought about by the **Abbey Plastics Corp.,** Hudson, Mass., who are producing this unique thermoplastic material for a wide variety of applications in place of conventional materials at a saving in both time and money.

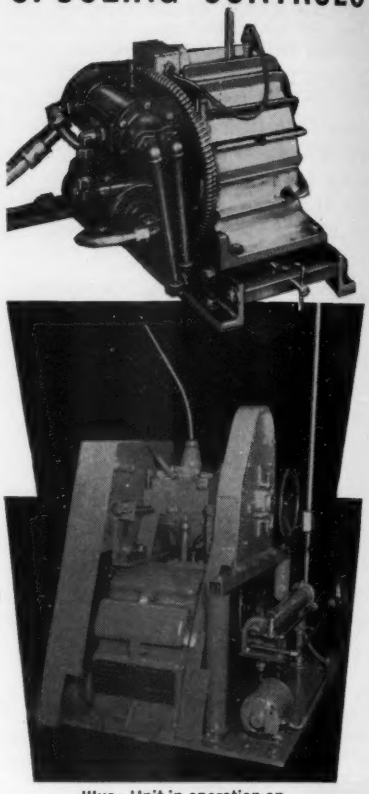
★ ★ ★

**Some** of the electrical uses are for microphone cable, aircraft deicing, replacement of copper braid in communication wire, conductor in ignition cable, shielding for coaxial cables, semi-conductive tapes and others.

★ ★ ★

A Technical Bulletin on Abbey #100, available to interested persons upon request, covers the material's physical, chemical and electrical properties.


TENSION AND SPOOLING CONTROLS



Illus.: Unit in operation on 75HP Capstan Holdback.

Tensolite, Anaconda, Plastoid, National Standard, Johnson Steel & Wire, Pittsburgh Steel, Boston Insulated Wire, Worcester Wire and a host of other wire producers found out that for successful SPOOLING
DRAWING
COATING
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HEAT TREATING, ETC.
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Proven Best For Web & Filament Machinery Since 1934
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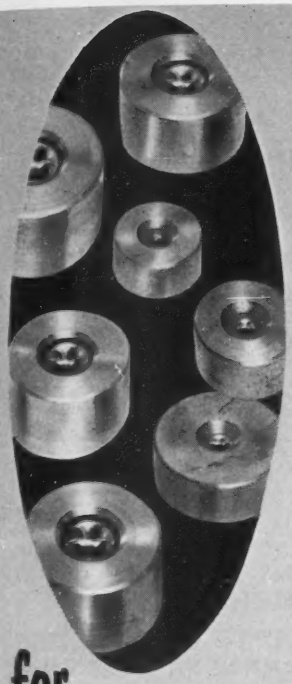

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Our rigid laboratory controls guarantee unfailing uniformity of Hyprez grading and concentration. That's one important reason for Hyprez superior performance—shorter finishing time—longer die life, greater production. Want proof? Ask your nearby Hyprez distributor for a free demonstration.

. . . or write for Technical Bulletin HW-49

HYPREZ DIVISION
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431 S. Dearborn St., Chicago 5, Illinois


## Sutton Straighteners with Syncro-Drive

**Sutton Engineering Company** has announced a complete new series of 5-roll, rotary bar and tube straighteners equipped with patented Syncro-Drive.

★ ★ ★

**Recent** demonstrations at the Sutton plant at Bellefonte, Pa., proved that Syncro-Drive provides a superior method of guideless, precision straightening. The finest quality of end-to-end straightness is achieved at high speeds. With Syncro-Drive, it is possible to straighten otherwise difficult and even "impossible" materials, such as thin-walled tubes and bars of stainless steel, brass, zirconium, titanium and other modern metals.

★ ★ ★

**Previously** thoroughly proven in small size machines, Syncro-Drive now is available in all sizes for tubes from 1/16″ to 6″ O. D. and bars from 1/16″ to 4″ Dia. in all metals. Each size machine straightens a wide range of sizes.

★ ★ ★

For additional information, write manufacturer at First National Bank Building, Pittsburgh 22, Pa.

## Alcoa and Rome Cable to Merge

**Rome Cable Corporation** and **Aluminum Company of America** have announced plans to affiliate.

★ ★ ★

**Frank L. Magee,** president of Alcoa, and **A. D. Ross Fraser,** president of Rome Cable, announced that agreement has been reached on a plan by which Alcoa will acquire all the properties of Rome Cable for 355,226 shares of Alcoa common stock. This will permit distribution to Rome shareholders of three shares of Alcoa common stock on each five shares of Rome common stock. The agreement is contingent upon approval of Rome shareholders, who will meet on March 25. If approved, it will take effect immediately.

★ ★ ★


ACCURATE TENSION CONTROL REQUIRES A

BOULIN TENSIOMETER

STATIONARY AND PORTABLE TENSIOMETER MODELS

For control of tension on wire in the processing of these materials into cables, coils, armatures, grids, etc. - wherever accurate winding requires tension control.

NINE RANGES OF CAPACITIES
Model D

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|---|---|
| 0-10 Grams | 0-10 Ounces |
| 0-25 " | 0-25 " |
| 0-50 " | 0-50 " |
| 0-100 " | 1-10 Pounds |
| 0-250 " | 2-20 " |
| 0-500 " | 3-30 " |
| 0-1000 " | 5-50 " |
| 0-2000 " | Other models and |
| 0-2500 " | capacities also available |

PULLEYS SUPPLIED IN ALUMINUM, HARDENED STEEL OR CORROSION RESISTANT METAL.

Sensitive and dependable — retains accuracy.

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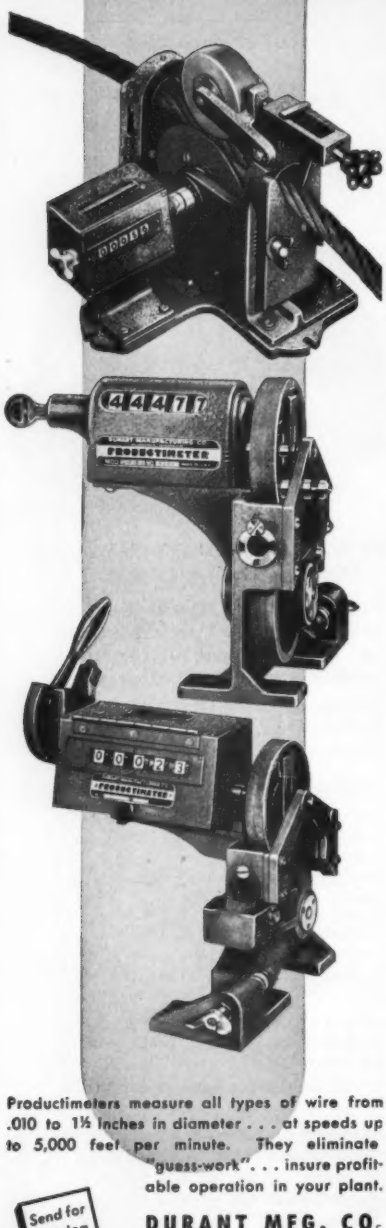
**PRODUCTIMETER**
**WIRE MEASURING MACHINES**
*Fast . . Accurate . . Dependable . . Legible*



Productimeters measure all types of wire from .010 to 1½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work" . . . insure profitable operation in your plant.

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**PRODUCTIMETERS**
SINCE 1879 *Count Everything*


**Alcoa** and Rome plan to combine their electrical conductor, conduit, and accessory activities in a new company to be called Rome Cable Company. The present members of Rome's management will continue in their present capacities in the newly formed company. **H. T. Dyett** will retire, but he will continue to serve on the board of directors of the new company. Alcoa plans to continue the fundamental policies established by the Rome management, and no major changes in personnel or operating procedures are anticipated.

### Folder on Hoists and Cranes

A well-documented 8-page folder, DH-28, illustrating the Wright line of Motor-Operated Hoists, Hand-Operated Hoists, Jit Cranes, Hand-Traveling Cranes and Motor-Driven Cranes, has been made available by the **Wright Hoist Division, American Chain & Cable Company, Inc.,** York, Pa.

★ ★ ★

**Of** interest to management engineers and maintenance personnel of industrial plants, the bulletin contains data on general features, construction details, weights, dimensions, suspensions, specifications, clearances, accessibility and other information for plant operators. Copy of DH-28 will be sent upon request.

### Reynolds Using New Cable Packing Method

**Faster** unpacking, less handling weight and equal protection are promised by a new type of cable reel packing being introduced by **Reynolds Metals Company** for reel sizes 48A through 69B.

★ ★ ★

**The** new packing consists of a wrap of resilient padding and an overwrap of plywood inside the reel flanges. The padding is of a fibrous material one inch thick with an adherent backing of moisture resistant kraft paper. The plywood overwrap is laminated on both sides to heavy, weather-resistant kraft paper for a total thickness of one-fourth inch.

★ ★ ★


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**DON'T PICKLE**

**WANT TO ELIMINATE YOUR PICKLE HOUSE**
**WANT TO COMBINE THE CLEANING PROCESS WITH MANUFACTURING PROCESSES FOR LOWER COSTS**

**THEN** investigate our new
**BLAST CLEANING CONSULTING SERVICE**

The wire industry is considering mechanical blast cleaning as a proven means of answering YES to these questions.

The logical **First Step** is a complete analysis and report covering your operations, and warranted by 14 years experience in the development and application of the process.

**WRITE NOW FOR BROCHURE OUTLINING THIS SERVICE**

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**The** entire wrapping is secured by metal strapping and can be removed in a fraction of the time needed for the heavy wooden lags previously used on the outside of the reels.

★ ★ ★

All cable shipments from the Reynolds Metals Company Alloys Plant at Listerhill, Ala., are using the improved packing, although the conventional wooden lagging will be available on special order.

### Superalloy Spring Wire Operates to 1000° F

**Superalloy** spring wire made of Inconel X has been introduced by **National-Standard Company,** Niles Mich., for aircraft, missiles, electronics, automotive and other high-temperature components that operate between 650 and 1000°F. The wire is heat-treatable nickel-chromium, iron, titanium material that can be precipitation hardened.

★ ★ ★

**Inconel X** Superalloy wire is available annealed from 0.005 to 0.166-inch diameter, in spring temper from 0.005 to 0.180-inch diameter, and in No. 1 temper from 0.005 to 0.230-inch diameter.

★ ★ ★

**Spring** temper is recommended for operating temperatures from 650 to 750°F. Corresponding tensiles range from 190,000 to 270,000 psi, depending on wire diameter. No. 1 temper is recommended for operating temperatures from 650 to 1000°F. Corresponding tensiles range from 130,000 to 165,000 psi, depending on wire diameter. Finishes include copper, lead, cowles lime, lime-oil and bright. Prices range from $6 to $16 per pound.

### Booklet on Machine Maintenance

A new 24-page booklet entitled "How to Make Your Own Machine and Repair Parts Quicker and Easier" has been published by **La Salle Steel Company.**

★ ★ ★

**The** booklet is designed especially to help solve maintenance and repair part problems, covering the care and trouble-shooting of machines and equipment, machin-


Quality
CARBIDE NAIL TOOLING
FOR ALL NAIL MACHINES

**Nail Machines We Have Equipped**

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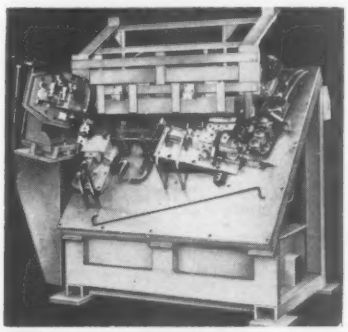
**HYDRAULIC FORMING MACHINE**



**FOR DIFFICULT FORMING**

Model #375 forms Oil Tempered Spring Wire or Rod up to 3/8" x 50" long, quickly and accurately. Complicated Shapes formerly impossible to produce in One Operation are now possible with WAMCO Forming Machines.

Easily Retooled for other Forming Jobs. Machine illustrated is Hopper Fed with Production Rate of 22 Finished Pieces per Minute—Automatically Ejected into container in front of machine.

**Your Wire Forming Problem may be easily solved with a WAMCO Automatic Machine.**

**FULL HYDRAULIC . . . FULLY AUTOMATIC CYCLE**

**High Production with Low Tool and Retooling Costs.**

**Other Models available for Wire from ⅛" to ½".**

**WORCESTER AUTOMATIC MACHINE CO.**

91 Webster Street, Worcester 3, Mass.

ing and welding techniques. It also contains drill hole tolerances and a grinding limits chart.

★ ★ ★

**Many** types of parts are almost universal throughout industry and the booklet pictures a number of these with descriptive case histories which discuss the benefits users have obtained by using "Stressproof", a high strength all-purpose steel bar. Pertinent machining problems and time and labor costs saved by using this material are discussed.

★ ★ ★

**Free** copies may be obtained by writing **W. E. Schneider,** LaSalle Steel Company, P. O. Box 6800-A, Chicago 80, Ill.

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MACHINERY FOR HIGH SPEED PRODUCTION

- BRAIDERS
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DEPENDABLE USED WIRE AND ALLIED EQUIPMENT WEST OF THE MISSISSIPPI AND IN THE PACIFIC EXPORT AREA. LARGE STOCKS CARRIED. IF WE DON'T LIST WHAT YOU WANT, FOR GOOD USED WIRE AND CABLE AND WIRE ROPE EQUIPMENT, ASK FOR IT.

*SOME EQUIPMENT ON HAND:*

Takeups, Payoffs, Braiders, Asbestos Carding Lines, Taping Machines.

13 Die Copper Rod Breakdown Machine with Cook M-1000 Spooler Takeup

WESTERN WIRE & TEXTILE MACHINERY, INC.
230 Shaw Road Tel: JUno 9-1101 So. San Francisco, Calif.


## Brochure on Wire Packaging

**An** ingenious "animated brochure" which presents the various methods of wire packaging available and shows in a most unique way the advantages of each, has just been issued by the **Wickwire Spencer Steel Division of The Colorado Fuel and Iron Corporation.**

★ ★ ★

**Titled** "Packaging Methods," this brochure unfolds to reveal a movable cardboard circle with two "windows" cut opposite each other. The interested reader turns the circle until one window shows the particular characteristic he is searching for such as "An extra long length." The opposite window then yields file numbers to be referred to which are visible on the opposite, facing page.

★ ★ ★

**By** pulling down the proper file number the whole story of that particular wire packaging advantage is visible in text and illustration.

★ ★ ★

**This** imaginative method of presentation of packaging method advantages is receiving considerable favorable comment from the sales promotion end of the industry.

## DuPont Opens New Lab

**A** new, modern research center for the Electrochemicals Department of **E. I. du Pont de Nemours & Company** was formally opened on January 16 at Niagara Falls, N. Y., adjacent to the company's manufacturing plant on Buffalo Avenue.

★ ★ ★

**The** work of the laboratory will be conducted under the direction of **Dr. Campbell Robertson,** who points out that it will be the focal point for research and development activities on sodium, vinyl products, peroxygen compounds, nylon intermediates and related fields. Development of new products will also be an objective.

★ ★ ★

**Among** the products and proc-

esses of this department of interest to the wire industry are methods of descaling metals, mainly stainless steels, through the use of sodium hydride, and trichloroethylene, a non-flammable chemical for degreasing metal.

### Wire Company Changes Name

**Inso Products, Ltd.** has changed its name to **Inso Electronic Products, Inc.** The change was announced by Harold N. Leitman, president.

★ ★ ★

**Inso** has also moved its general sales office from the Adam offices at 404 Fifth Avenue, to the Inso Plant, 1200 Commerce Avenue, Union, N. J.

★ ★ ★

**Jerome I. Cohn,** Inso general manager, explained that the company will continue to manufacture fused-film Teflon insulated wire and cable. The new name, he said, is in keeping with the company's broadening scope of operation and the increasing diversification of its role in the electronics industry.

### New Corporation Formed

**Welcraft Products Co., Inc.,** New Carlisle, Ind., has announced the formation of a new corporation, **Wirekraft, Inc.,** to take over its wire manufacturing operations.

★ ★ ★

**Emil C. Evancich,** formerly Chief Engineer of Welcraft, will serve as President of Wirekraft, Inc. and Larry G. Rubeck has been named Factory Manager.

★ ★ ★

**Wirekraft** manufactures lead wire, low temperature heater wire, and electrical grade tubing.

### New Wire Industry Encyclopaedic Handbook

The 1959 edition of this English directory has been issued by **The Wire Industry Ltd.,** 33 Furnival St., London E. C. 4.

★ ★ ★

It includes a trade summary for 1958, a buyers' guide to supplies,


"PARALAN"

RUST PREVENTATIVES LUBRICANTS

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LAWRENCE, MASS.

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Open hearth grades from low metalloid through high carbon, Thomas grades, cold heading and special grades for sensitive applications. Heavy coils up to 880 lbs.—I.D. up to 33½". Sizes from .200" to ¾".

Reliable delivery schedules at a fair price.

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211 sizes Bright Polished, .0015" to .3437"

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**STRONG METAL BOUND RETURNABLE REELS**

FAST DEPENDABLE SERVICE ON QUALITY REELS, 12" TO 30" DIAM.

Built to take a beating! Built to protect Coated or Insulated Wire from damage! Kiln dried stock — No nails — Bolted, Waterproof, Glued construction. Especially designed to prevent breaking or splintering.

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WIRE FLATTENING MACHINES • ROLLS (Ground or Plain)
SPOOLERS • COILERS • DRAW BENCHES • ET CETERA
*Send us your requirements and specifications for quotations.*
**GENERAL MACHINE TOOL CO.**
18 GRAFTON STREET • WORCESTER 8, MASS.
Tel.: PLeasant 2-0976

a list of brand names, a dictionary of technical and commercial terms, and an appendix giving wire tables, British Standards, directory of recent articles, general terms and a directory of trade associations.

★ ★ ★

**The** new Encyclopaedia is available for purchase and may be ordered from the publisher at the address above.

## Bulletins on Wire Handling Equipment

**Northern Indiana Steel Supply Co.,** Fabricating Div., Michigan City, Ind., has issued three one-page bulletins on their line of Wire Carriers and Pay-Off Reels, which are made to handle 2000 to 4000 pound coils of wire.

★ ★ ★

**Copies** of this literature may be secured by addressing a request to the company.

## Issues Wire Catalog

**The Lancashire Wire Co. Ltd.,** Trafford Park, Manchester 17, England, has issued a new catalog descriptive of its range of manufactures.

★ ★ ★

**A** list of the low and medium carbon steel wire is given, together with a description of the company's production facilities.

★ ★ ★

**The** firm states that whereas wire has been available in sizes of ½" diameter down, new equipment is being added that will make it possible to supply wire up to ¾" in diameter within a few months.

★ ★ ★

**Copies** of the booklet are available upon request to the company.

## Pre-Packaged Copper-Covered Tie Wire

**Pre-packaged** copper-covered steel wire has been introduced for use with tie wire reels for fastening pipe insulation where salt spray and other corrosives prevail, according to the National-Standard Company.

★ ★ ★

**The** pre-packaged wire, known

For WIRE DRAWING
Warner
BELL MINE LIME PRODUCTS
Strict laboratory control assures uniform quality
*Pulverized Quick Lime*
*Hydrated Lime*
*Pebble Lime*
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You Can Depend on "NATIONAL"
DIAMOND POWDERS
For Consistent High Quality
They Are ALWAYS Clean, Sharp and Accurately Graded for Use.
ONLY TOP QUALITY GRADES!
*SPECIAL SERVICE*

DIAMOND POWDER RECLAIMING
Our exclusive process gives maximum recovery, highest salvage. Send us your old cotton, die washings, sludge and wheels.

DIAMOND GRINDING WHEELS
A complete line of fine quality wheels for industrial production.

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as Copperply, is 16 gauge, with 15 per cent copper by weight, providing a 1¾ mil protective copper coating around the steel core.

★ ★ ★

**Made** by continuously electroplating copper concentrically around a steel core wire, Copperply is pre-packaged by National-Standard in 4-lb coils for sale by the **Ideal Reel Company,** Paducah, Ky., with its Ideal Tie Wire Reel.

★ ★ ★

**Copperply** tie wire used in conjunction with the reel permits up to 25 per cent more ties per manhour than pulling wire from a loose coil, according to Ideal Reel, in addition to greatly increased safety. Wire consumption is cut by an average of 20% because waste is eliminated.

## Bulletin on Plasticizers

**The Harchem Div. of Wallace & Tiernan, Inc.,** 25 Main St., Belleville, N. J., has issued a new bulletin on Dioctyl Sepacate, a plasticizer that has some unusual properties, where top quality or extremes in properties in insulating coatings are required.

★ ★ ★

**The** bulletin, which gives applications, electrical data, specifications and physical properties, will be sent by the company upon request.

## Wire Reinforcement Institute Meeting

**The** annual Spring Meeting of the **Wire Reinforcement Institute, Inc.,** will be held at the Greenbriar, White Sulphur Springs, West Va., on May 25 and 26, 1959, according to an announcement by **Frank B. Brown,** Managing Director.

## Wire and Cable Symposia Being Held

**To** bring about a better understanding of their engineering, development and manufacturing facilities, the **William Brand & Company,** Willimantic, Conn., has initiated a series of wire and cable symposia throughout the country.

ENGINEERED YARNS
FOR WIRE INSULATION

SYNTHETIC THREAD'S TECHNICAL SERVICE,

with its long experience and knowledge of the Insulated Wire business, is available to help you select the BEST YARNS at the BEST PRICES for your special needs.

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- For Hot or Cold horizontal marking at the extruders or as a separate operation.
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MACHINERY

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MACHINES FOR NETTING, BARBED WIRE, PINS, HEADED PRODUCTS, SCREWS, SPRINGS, ETC.

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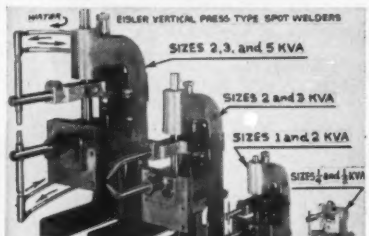


Wire Cutting-Straightening and Forming Machines for All Types of Wire

EISLER ENGINEERING CO., INC.
CHARLES EISLER, Jr., Pres.
747 South 13th St. Newark 3, N. J.

**Generally** held in the evenings, the symposium program consists of a slide presentation with commentary by sales and engineering personnel, followed by discussions.

★ ★ ★

**Symposia** have already been held in Philadelphia, Pa., Orlando, Fla., and Waltham, Mass., and others will be held at various points from time to time.

## Develops New Polyurethane Material

**Development** of a unique new polyurethane material with outstanding properties for industrial applications has been announced by **B. F. Goodrich Chemical Company**, a division of The B. F. Goodrich Company, Akron, Ohio.

★ ★ ★

**Called** Estane VC, the new product is a thermoplastic elastomer that has extremely high tensile strength at high ultimate elongation; excellent solvent resistance, particularly to gasoline; low air permeability; and outstanding abrasion resistance.

★ ★ ★

**The** material is available in the form of tough, rubbery, clear granules that are converted into end products by milling, calendering, extrusion, or molding.

★ ★ ★

**First** major application for Estane VC is expected in the field of wire and cable jacketing. Other potential uses include: fuel hose, small-bore tubing, belting, coated fabrics, sheeting for equipment liners, engine mounts, valve diaphragms, pump components, and insulators.

★ ★ ★

**It** is being produced in commercial quantities at the Avon Lake (Ohio) Development Center of B. F. Goodrich Chemical Company.

## Wire Kinks

(*Continued from page* 465)

6 in column B and simply glance across to column A. It will be found that the answer is 29 h.p.

## New Fencing Catalog

**"American Fence Products,"** a new illustrated general catalog listing fence and kindred products produced by **American Steel & Wire Division,** has just been prepared and is available from this U. S. Steel affiliate.

★ ★ ★

**In** addition to describing numerous types of fences and posts, the 41-page catalog also contains information and specifications on such other American Steel & Wire items as bale ties, corn cribs, hardware cloth, nails, roofing sheets, welded wire fabric, stone wire, trellises and agricultural wire rope.

★ ★ ★

**A** unique chart and table takes the guesswork out of how much fence and how many posts are required to enclose farm acreage.

★ ★ ★

**Copies** may be obtained from the Advertising Department, American Steel & Wire Division, U. S. Steel Corporation, Rockefeller Building, Cleveland 13, Ohio.

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SINGLE and DOUBLE STROKE
COLD HEADERS
IN ¼" X 2" CAPACITIES
FOR UPSETTING AND FORGING BOLTS, SCREWS, RIVET HEADS, AND OTHER SIMILAR SHAPES

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IT'S HERE

The Tinning Die that really works.

Heanium Dies and Nibs are a great economizer when used for applying heavy tin coat to wire. Metal does not adhere to polished Heanium allowing it to be used in place of more costly materials for the heavy tinning operation — bringing you great savings. Heat or acids do not affect Heanium. Available mounted or unmounted — rough cored or finished to size. They can be easily recut on standard die equipment in only a fraction of the time required by other materials bringing you further savings. Try them — order now. Heanium Wire Dies are manufactured exclusively by:

ROUX WIRE DIE WORKS, INC.
ORISKANY, N. Y., PH: UTICA 6-2373


## Haveg Opens Office In Atlanta

**Haveg Industries, Inc.** announces the opening of a district sales and engineering office in Atlanta, Ga., at 3230 Peachtree Road N.E. **Thomas H. McGrath** is being transferred from Haveg's Cleveland Office where he was District Sales Engineer to take over as District Sales Manager at Atlanta.

★ ★ ★

**The** new office will service the area with a complete line of corrosion resistant chemical process equipment such as process tanks, heat exchangers, chlorine equipment, towers, absorbers, scrubbers, fractionating columns, fume removal equipment, pipe and fittings. 10 other district offices and plants are located in Marshallton, Del.; West Warren, Mass.; Warren, Mass.; Winooski, Vt.; San Juan, Puerto Rico; Norwalk, Calif.; and Santa Fe Springs, Calif.


Our Advertisers are Reliable
Patronize Them


## Prentiss Issues Revised Wire Folder

A six-page folder, briefly describing the various types of wire produced at **Prentiss Wire Mills, Riverside-Alloy Metal Div., H. K. Porter Co., Inc.,** has been revised. This bulletin, originally published shortly after Prentiss joined Porter's metals division, includes some of the new specialties now produced.

★ ★ ★

**The** folder, entitled "Prentiss Wire Products," provides a summary of the many kinds of ferrous and non-ferrous wire that Prentiss supplies, including a wider range of wire sizes made possible through the installation of new equipment.

★ ★ ★

**An** increase in the non-ferrous alloys available is another noticeable change. These include Phosphor Bronze, K Bronze, Brass, Monel, Nickel Silver, Stainless Steel and Beryllium Copper. Certain wire specialties, such as Hose Wire, have been added

★ ★ ★

**The** various spools and coils for Prentiss wire are pictured in the folder along with brief descriptions of these put-ups. Also included are handy wire gauge tables showing both W&M and B&S gauges.

★ ★ ★

**Copies** of the folder are available on request from: Advertising Department, Riverside-Alloy Metal Division, H. K. Porter Company, Inc., Riverside, N. J.


BALLOFFET VIANNEY
WIRE DIE CO., Inc.

All sizes from .114" down to 0003" in stock from New York.

Manufacturers of
Quality diamond dies since 1870

BALLOFFET VIANNEY
WIRE DIE CO., Inc.
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Tel: Union 3-3393


## Ductile Iron Spools Effect Savings

For stranding steel wire, **John A. Roebling's Sons Co.,** Trenton, N. J., is saving from 20 to 30% of the former cost per spool by using spools of ductile-iron alloy 60-45-10. The new spools are cast by **T. B. Wood's Sons Co.,** Chambersburg, Pa., in diameters of 5 and 9⅞ in. They also offer certain physical advantages over materials formerly used.


TUNGSTEN CARBIDE WIRE DRAWING DIES
DESIGNED FOR LONG LIFE AND MAXIMUM WIRE PRODUCTION

Furnished semi-finished to within .001" to .002" of finished size at rough-drilled die prices. Require only light sizing and polishing before using. Our dies embody special design features that make for superior performance.

ALSO, A FULL LINE OF CARBIDE TOOLING FOR THE COLD HEADING INDUSTRY

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NEW ROCHELLE, N. Y.

DIAMOND WIRE DRAWING DIES
DIAMOND POWDER AND COMPOUNDS
DIE RECUTTING SERVICE
CARBIDE DIES • TOOLS • PARTS
RUSCH WIRE DIE CORPORATION
CROTON-ON-HUDSON, N. Y.

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL AJAX SUPPLIES INC.
R.R. 4, P. O. Box 66, Fort Wayne, Ind.

NEW ENGLAND WIRE DIE CO.
7 Forsberg St., Worcester, Mass.
EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
Ajax Industrial Supplies, Inc.

DIAMOND DIES
PROFILED DIES
FINE SIZE DIES
VICTOR J. BOULIN INC.
10 FIRST STREET, PELHAM, N. Y.

Drawing Angle-Controlled
DIAMOND DIES
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1730 Sinclair St., Ft. Wayne, Ind.

DIAMOND POWDER
Diamond Reclaiming Services
FORT WAYNE DIAMOND PRODUCTS, Inc.
2623 E. Pontiac Fort Wayne 5, Indiana

FINE WIRE 8-SPINDLE TAKE-UPS
COLBOURNE
Machine Co., 21 Munro St.
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DIAMOND
and
TUNGSTEN CARBIDE
DIES
for all WIRE DRAWING purposes.
SPECIALISTS IN DIE REPAIR WORK ON ALL TYPES OF DIES.
UNIVERSAL WIRE DIE CO.
202 Pennsylvania Ave., Hillside, N. J.
ELizabeth 2-2456

The 5-in. spools formerly were fabricated from high-carbon steel (0.50 to 0.60% carbon). The fabricated steel spools had crevices where the flanges join the spool barrel. Frequently a wire would snag in a crevice, causing production delays, spool damage and wire waste. The ductile-iron spools are cast in one piece, ending the snagging.

★ ★ ★

The 9⅞-in. spools previously used were cast in one piece but were made from malleable iron, which has a much lower yield strength than the ductile-iron alloy and the spools were vulnerable to the rough handling to which stranding spools are subjected. Tension grooves would nick and flanges bend. Both difficulties have been sharply reduced with the use of the tougher ductile iron.

★ ★ ★

**Ductile-iron** alloy 60-45-10 has an essentially ferrite structure and combines tensile strength with maximum toughness. Tensile strength is in the range between 60,000 and 80,000 psi.

## Armco Expanding Baltimore Works

A $775,000 expansion program to increase **Armco Steel Corporation's** stainless steel output will begin this month at the Baltimore, Md., Works, **C. G. Davies,** vice president — operations, Armco Division, has announced.

★ ★ ★

Two new double ingot heating furnaces and three new heat-treating furnaces are to be installed, which will permit the production of increased tonnages of special grades of stainless steel now in greater demand by customers.

Get the habit of reading
regularly
WIRE AND WIRE PRODUCTS
The Wire Man's Magazine

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mounted unmounted
For Precision Wire Drawing
BRENON, INC.
Experts in Fine Size Diamond Dies
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REVERSIBLE DIAMOND DIES
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Diamond Dies for Wire Drawing
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wire rod descalers
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HI-SPEED TAPING MACHINES
MULTI-TINNING TAKE-UPS
FINISH LINE TAKE-UPS
*The finest that can be produced.*
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(Est. 1866)
WIRE & CABLE MACHY. DIV.
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.000's to .102"
For many years . . .
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**METALLIZING WIRE**
PURE ZINC and CADMIUM
Other Fine Bare Wires
Manufactured to Your Specifications
IMMEDIATE DELIVERY
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**FINE WIRE RESPOOLING MACHINES**
**COLBOURNE**
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for fast, economical heat treatment
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1" to 60" Diameters
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CHICAGO 39, ILLINOIS

Steel & Wire machinery co.
15457 EUCLID AVE. CLEVELAND 12, OHIO
EXCLUSIVE DISTRIBUTOR FOR FARMER NORTON WIRE DRAWING MACHINES

**WORK WITH WEBB**
for finer quality wire
Stainless • Needle • Nickel Alloy
**WEBB WIRE**
DIVISION OF THE CARPENTER STEEL CO.
NEW BRUNSWICK, N. J.

## Facts on Butyl Rubber for Wire and Cable

**Properties** of Butyl rubber for insulating and jacketing electric wire and cable are presented in a new brochure available from **Thiokol Chemical Corporation.** Prepared with the assistance of consultants in the wire and cable field, the 12-page booklet compares the physical, electrical and chemical properties of Butyl with other elastomers used in this $2 billion market. Accelerated tests conducted by wire and cable processors are also shown to illustrate procedures followed to obtain the greater service life and current capacities available from cable insulated with Butyl.

★ ★ ★

**Included** in this brochure is a list of wire and cable manufacturers who offer improved Butyl wire and cable, together with the trade names for their products.

★ ★ ★

**Entitled** "Butyl . . . a unique elastomer for the wire and cable industry," the brochure is available on request from Thiokol Chemical Corp., 780 North Clinton Ave., Trenton 7, N. J.

Pan American
For All Your Needs in Wire Working Machinery
**Pan American Supply Company**
15 WEST 46th STREET NEW YORK 36, N. Y. OXford 7-6100

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SPARKERS — TAKE-UPS
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Wood, Plywood, Hardboard
8" to 72" in diameter
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**For conformance with MIL-C-12064A (CE)**
SCOTT MODEL E
"For Cable, Power, Electric, 600-volt, for field use the (insulation) brittleness shall be evaluated by the solenoid operated American Cyanamid tester." This specification pinpoints the applicability of the Scott Model E Brittleness Tester for this test.
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SPIRAL WRAPPING MACHINES
For Coils or Straight Lengths
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***Immediately Available***
**WIRE WORKING MACHINERY**
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Machine Co., 21 Munro St.
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3 Watson V-7 Bunchers in excellent running condition.
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**FOR SALE**
6 SYNCRO Model HS-1-A High Speed 7 Bay Tubular Stranders, like new. 15 lb. Pay-Off Spools with 1000 lb. Take-ups. Machines practically new and are now running, can be inspected. Write or phone
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618 Main St., West Warwick, Rhode Island
Telephone: VAlley 1-1700

EXECUTIVE ENGINEER
Twenty-five years magnet wire experience including equipment design and construction, production, plant installation and management, and research. Seeks opportunity preferably in south or southwest.
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BRITE BASIC WIRE ROD
all @ $7.75 cwt.
**SEABOARD STEEL CO.**
NEW HAVEN, CONN.

AVAILABLE
Open Time Drawing Copper Wire, Hard or Soft. 5/16 Rod to #30 Gauge Fine Wire. Also Tinning and Bunching. Toll Work Preferred. Bonded Company.
**EASTERN WIRE**
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## Flexible Anodized Insulation Developed

**Flexible** aluminum - oxide - insulated wire good for temperatures as high as 1100°F and, in certain forms, as high as 1900°F, is now available from **Permaluster, Inc.**, of Burbank, Calif. The anodixed wire in all gages and sizes is made by the same Permaluster continuous anodizing process already successfully applied to high temperature wire for the aircraft-missile and electronic industries, which provides a coating that is highly flexible and capable of withstanding severe deformation.

★ ★ ★

**With** its melting point of 3800°F, aluminum oxide provides excellent protection. The film thickness can be carefully controlled from as low as 0.00008" to 0.001".

★ ★ ★

**The** insulation can also be applied to other metals. One example is nickel plated copper wire (nickel plate is needed to eliminate galvanic action and diffusion in high temperature operation). It can also be used on silver for applications close to the approximate 1900°F melting point of the bare conductor.

★ ★ ★

A technical bulletin on the process is available by writing to Permaluster, Inc., 2012 West Burbank Blvd., Burbank, Calif.

## Bright Vinyl-Clad Screening

**"Vinalume"** insect screening with a metallically bright and shiny aluminum color is announced by the **New York Cloth Company.** The cladding was developed after months of research and was first introduced with a gray finish. In both finishes the vinyl cladding is applied to the aluminum core wire before weaving by a process on which patent is pending.

★ ★ ★

**Combining** the wearing quality of aluminum with the corrosion protection of vinyl, "Vinalume" is particularly desirable for homes near the seacoast. Salt-spray and weather tests equivalent to over four years' exposure had no corrosive effects on this screening, revealing a life expectancy said to be "in excess of any other screening previously tested."

★ ★ ★

**"Vinalume"** is woven in standard 18 by 14 mesh using a wire with a finish size of 0.013 in. Available in 100-foot or mill-length rolls in standard screening widths. **New York Wire Cloth Company,** 441 E. Market St., York, Pa.

## Brochure on Testing Laboratory Facilities

A brochure describing the facilities of a commercial testing laboratory is now available from **New York Testing Laboratories, Inc.,** 47 West St., New York 6, N. Y., which was established in 1919.

★ ★ ★

**The** publication describes their complete services which include electronic and environment testing, materials evaluation, a metallurgical laboratory, radiography and non-destructive testing (X-Ray), and a Chemical Laboratory.

**CHEMIST**
•
**METALLURGIST**

Due to expansion two rare openings have occurred in our Product Development Department. Both offer unusual opportunities for recent college graduates in chemistry or metallurgy. A basic knowledge of COLD FORMING metals will prove helpful to applicants for one of the openings, while familiarity with LUBRICATION as applied to COLD FORMING metals will be an asset to applicants for the other. We are only interested in interviewing applicants of superior character and trust who, when fully acquainted with our methods for the chemical treatment for COLD FORMING metals, will be required to carry out assignments in our customers' plants. Our firm, established 45 years ago, is a pioneer in this type industry. In addition having an excellent record for growth and stability it has earned the reputation for being "a nice place to work." It provides liberal company benefits, pleasant working conditions and congenial associates. Write in confidence, stating your complete history of employment and education, also your salary requirements. Direct replies to:

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(Formerly American Chemical Paint Co.)
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# Index to Advertisers


A

Acrometal Products, Inc. ..... 443
Advanced Wyrepak Co., Inc. ..... 466
Ajax Electric Company ..... 513
Ajax Industrial Supplies, Inc. ..... 512
Ajax Manufacturing Company, The ..... 425
Amchem Products, Inc. ..... 400
American Chain & Cable, Page Steel & Wire Division ..... 424
American Insulating Machinery Company ..... 483
American Lanolin Corp. ..... 507
American Laubscher Corporation ..... 413
American Woodworking Company ..... 513
Apco Mossberg Company ..... 472
Apex Alkali Products Company ..... 390

B

Balloffet-Vianney Wire Die Co., Inc. ..... 511
Bartell Machine-Tool Corp. ..... 473
Behr Machinery & Equipment Corp. ..... 510
Bethlehem Steel Company ..... 414
Blane Corporation, The ..... 417
Boulin Instrument Corporation ..... 503
Boulin, Victor J., Inc. ..... 512
Brenon, Inc. ..... 512
Bridge Manufacturing Company ..... 395

C

Carl Mayer Corp., The ..... 500
Carpenter Steel Co., The Webb Wire Div. ..... 513
Carter, B. & F., & Co., Ltd. ..... 501
Central Tool and Machine Co., Wire Tool Division ..... 496
Clark, J. L., Manufacturing Co. ..... 430
Cleveland Tramrail Division,
The Cleveland Crane & Engineering Co. ..... 402
Colbourne Machine Co. ..... 512, 513 and 514
Collins Bros. Machine Co. ..... 512
Continental Steel Corporation ..... 474
Cook Manufacturing Co. ..... 406
Coulter & McKenzie Machine Co., Inc., The ..... 434

D

Danforth, C. W., Co. ..... 496
Davis Electric Co. ..... 513
Daystrom-Weston Industrials Gauges ..... 386
Dill, Gilbert D. ..... 504
Durant Manufacturing Co. ..... 504
Durkee Mfg. Co., Inc. ..... 513
Dykrex Corporation of America ..... 502

E

Eastern Carbide Corp. ..... 511
Edmands Co., The ..... 497
Eisler Engineering Co., Inc. ..... 510
Elgin National Watch Company, Abrasives Division ..... 457
Emory, Robert J., Company ..... 499
Engis Equipment Co., Hyprex Division ..... 503
Enjaco Corporation ..... 490
Entwistle Manufacturing Corporation ..... 387
E. V. G.—Maschinen & Stahl, A. G.—Richard E. Kleinhans ..... 494

F

Fisher Associates ..... 512
Fort Wayne Diamond Products, Inc. ..... 512
Fort Wayne Wire Die, Inc. ..... 512

G

Gem Gravure Co., Inc. ..... 509
General Machine Tool Co. ..... 508
General Tire & Rubber Co., The, Chemical Division ..... 407
Gillies, Duncan M., Co., Inc. ..... 470
Glader, Wm., Machine Works ..... 481

H

Hanson & Edwards, Ltd. ..... 493
Haskell-Dawes Machine Co., Inc. ..... 498
Heany Industrial Ceramic Corp. ..... 397
Herborn, Maschinenfabrik ..... 423
Hodge Bros. Machine Shop ..... 513
Hoosier Wire Die, Inc. ..... 512
Hubbard Spool Division, The American Pulley Company ..... 388

I

Indiana Wire Die Company ..... 512
Interlocking Fence Co. ..... 484

J

Jones & Laughlin Steel Corporation, Stainless & Strip Div. ..... 391
Jones & Laughlin Steel Corporation, Wire Products ..... 454-455

K

Kelly Wire Die Corporation ..... 512
Keystone Steel & Wire Company ..... 401

L

Larmuth (1947) Ltd. ..... 500
Lewis Machine Company, The ..... 421

M

Magnuson Products Corporation ..... 499
Malin & Company, The ..... 507
McCaskie, Wm., Inc. ..... 508
Metal Carbides Corporation ..... 433
Metallurgical Products Department, General Electric ..... 431
Mettler Machine Tool, Inc. ..... 404
MH. Machines, Morgardshammar Mek Verkstads AB ..... 399
Michigan Oven Company ..... 418
Micro Products Co. ..... 394
Miller, R. H., Co., Inc. ..... 436
Molded Fiber Glass Tray Co. ..... 513
Monsanto Chemical Company, Plastics Division ..... 398
Montgomery Co., The ..... 508
Morgan Construction Company ..... 428 and 429
Mossberg Pressed Steel Corporation, Division of Wanskuck Co. ..... 482

N

National Lock Washer Company, The ..... 403
National Machinery Exchange ..... 513
National Research Company ..... 509
National Standard Company ..... 392 and 393
National Wire Die Co., Inc. ..... 512
Naugatuck Chemical Division, United States Rubber Company ..... 415
New England Butt Co., Division Wanskuck Company ..... 506
New England Wire Die Co. ..... 512
New York Engineering Company ..... 475
Nichols Wire & Aluminum Co. ..... 432
Nopco Chemical Company ..... 495
Northern Indiana Steel Supply Co., Inc. ..... 426

O

Ofenbau Fritz, G.m.b.H. & Co., K. G. ..... 485
Orban, Kurt, Company, Inc., Niederrheinische Huette A. G. ..... 507

P

Pan American Supply Company ..... 513
Pangborn Corp. ..... 477
Parkin Chemical Co., The ..... 513
Peschel Electronics, Inc. ..... 488
Pettibone Mulliken Corporation ..... 405
Pittsburgh Carbide Die Company ..... 505
Pittsburgh Steel Company ..... 410-411
Plastic Mold & Engineering Co. ..... 498
Platt Bros. & Co., The ..... 513
Porter, H. K. Inc. ..... 478
Plymouth Cordage Company, Plymkraft Division ..... 486

R

Reicher, Paul—Niehaus, K. A. ..... 492
Reicher, Paul—Schlatter, H. A., Ltd. ..... 420
Robinson, M. W., Co. ..... 389
Roebling's, John A., Sons Corporation ..... 419
Roux Wire Die Works, Inc. ..... 511
Royle, John, & Sons ..... 491
Rusch Wire Die Corporation ..... 512

S

Scott Testers, Inc. ..... 513
Scudder, E. H., Foundry & Machine Co. ..... 513
Seymour & Peck Div., The Grief Bros. Cooperage Corporation ..... 495
Sjogren Tool & Machine Co., Inc. ..... 493
Smith, Frederick, & Co. Wire Manufacturers Ltd. ..... 416
Stamford Processing Co. ..... 513
Stanat Manufacturing Co., Inc. ..... 480
Standard Industrial Compounds Co., Inc. ..... 385
Standard Mill Supply Company ..... 489
Steel Equipment Company ..... 409
Steel & Wire Machinery Co. ..... 513
Superior Tool & Manufacturing Co. ..... 508
Syncro Machine Company ..... Back Cover
Synthetic Thread Corp. ..... 509

T

Takemura & Co., Ltd. ..... 510
Terkelsen Machine Company ..... 513
Twitchell, E. W., Inc. ..... 471

U

U. S. Industrial Chemicals Co., Division of
National Distillers and Chemical Corp. ..... 408
United States Rubber Company, Naugatuck Chemical Division ..... 415
United Wire and Supply Corporation ..... 479
Universal Wire Die Co. ..... 512

V

Vaughn Machinery Company, The ..... Front Cover

W

Wafios Maschinenfabrik ..... 412
Wardwell Braiding Machine Co. ..... 476
Warner Company ..... 509
Waterbury-Farrel Foundry & Machine Co., The
Division of Textron, Inc. ..... 462
Watson Machine Company, The ..... Inside Back Cover
Wayne Wire Die Company ..... 512
Web Controls Corp. ..... 502
Wells, Frank L., Company ..... 487
Western Wire & Textile Machinery, Inc. ..... 506
Whitacre Engineering & Manufacturing Company ..... 396
Wickwire Brothers, Inc. ..... 506
Wilson, Lee, Engineering Company, Inc. ..... Inside Front Cover
Wire & Textile Machinery, Inc. ..... 507
Wood's T. B., Sons Company ..... 501
Worcester Automatic Machine Co. ..... 505

Y

Youngstown Sheet and Tube Company, The ..... 422

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Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit
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Larmuth and Bulmer, Limited, Manchester, England

**MACHINERY—Bolt, Rivet, Screw, etc.**
Behr Machinery & Equipment Corp., Rockford, Ill.
Takemura & Co., Ltd., New York, N. Y.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Braiding**
New England Butt Co., Providence, R. I., Division of Wanskuck Co.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Bunching**
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Bundling, Scrap**
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Cable, Electric**
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Synero Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)**

**MACHINERY—Centerless Grinding & Polishing**
American Laubscher Corporation, New York, N. Y.

**MACHINERY—Chain Link Fence**
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio

**MACHINERY—Chain Making**
Larmuth and Bulmer, Limited, Manchester, England
Pan American Supply Company, New York, N. Y.
Steel & Wire Machinery Co., Cleveland, Ohio

**MACHINERY—Closing Rope**
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

**MACHINERY—Coiling Rod**
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Cold Heading**
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Copper Wire Drawing**
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden.
National Mach'y Exch (Used), New York
Steel & Wire Machinery Co., Cleveland, Ohio
Synero Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)**

**MACHINERY—Cutting**
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Pan American Supply Company, New York, N. Y.

**MACHINERY—Dead Block (Stationary Coiler)**
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Descaling Rod, Dry**
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Pangborn Corporation, Hagerstown, Md.

**MACHINERY—Diameter Control**
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.

**MACHINERY—Die Making**
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Metallurgical Products Dept. of General Electric Co., Detroit
Wayne Wire Die Co., Hillside, N. J.

**MACHINERY—Draw Benches**
General Machine Tool Co., Worcester, Mass.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)**

**MACHINERY—Enameling**
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

**MACHINERY—Extruding**
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
General Eng. Co. (Radcliffe) Ltd., Radcliffe, Eng.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Fence**
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England

**MACHINERY—Flat Wire**
General Machine Tool Co., Worcester, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Stanat Manufacturing Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Forming Wire**
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.

**MACHINERY—Galvanizing Wire**
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

**MACHINERY—Gang Winders**
Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Grinding**
Norton Co., The, Worcester, Mass.

**MACHINERY—Insulating Wire**
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)**

**MACHINERY—Lacquering Electric Wire**
American Insulating Mach'y Co., Philadelphia
Cook Mfg. Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Michigan Oven Company, Detroit, Mich.

**MACHINERY—Lock Washer**
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Material Handling**
(See Material Handling Equipment)

**MACHINERY — Measuring Diam., Insulated Wire**
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.

**MACHINERY—Measuring Wire & Cable**
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Divis'on Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Nail and Tack**
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.

**MACHINERY—Packaging Wire**
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Patenting Wire**
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Pin Making**
Takemura & Co., Ltd., New York, N. Y.

**MACHINERY—Plating**
Bartell Machine Tool Corp., Rome, N. Y.
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

**MACHINERY—Pointing**
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York,
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Printing on Electric Wire**
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

**MACHINERY—Re-Spooling**
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Machine Tool Co., Worcester, Mass.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
National Mach'y Exch. (Used), New York N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

**MACHINERY—Rod Mill**
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

**MACHINERY—Rolling Mill**
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Rubber Insulating**
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Serving**
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

**MACHINERY—Slitting Mills**
Steel Equipment Company, Cleveland, Ohio

**MACHINERY—Spark Testing**
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Peschel Electronics, Inc., Towners, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Special**
General Machine Tool Co., Worcester, Mass.

**MACHINERY—Spooling Tension Controls**
Web Controls Corp., West Englewood, N. J.

**MACHINERY—Spring Making**
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells Company, Frank L., Kenosha, Wisc.

**MACHINERY— Staple Making**
Pan American Supply Company, New York, N. Y.

**MACHINERY—Straightening & Cutting**
American Laubscher Corporation, New York 19, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.
Wells Company, Frank L., Kenosha, Wisc.

**MACHINERY—Stranding**
Bartell Machine Tool Corp., Rome, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Düsseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Swaging**
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Take-Up and Pay-Out**
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Kraft, J. A., Maschinenfabrik, OLPE/Westf. Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A., Co., Inc., Cleveland, Ohio
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Taping**
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**MACHINERY—Testing for Dielectric Faults**
Peschel Electronics, Inc., Towners, N. Y.

**MACHINERY—Testing, Physical**
Scott Testers, Inc., Providence, R. I.

**MACHINERY—Thread Rolling**
Mettler Machine Tool, Inc., New Haven, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

**MACHINERY—Tinning Wire**
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

**MACHINERY—Tinsel Rolling Mills**
American Insulating Mach'y Co., Phila., Pa.

**MACHINERY—Trolley Wire**
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Tube Mill, Cold Drawing**
Mettler Machine Tool, Inc., New Haven, Conn.

**MACHINERY—Twinning**
(See Mach.—Bunching)

**MACHINERY—Twisters, Wire**
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

**MACHINERY—Used**
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

**MACHINERY—Welded Wire Mesh**
Maschinen and Stahl, A.G., Zurich, Switzerland.
National Electric Welding Machines Co., Bay City, Michigan
Schlatter, Ltd., H. A., Zollikon/Zurich

**MACHINERY—Wire Weaving**
Takemura & Co., Ltd., New York, N. Y.

**MACHINERY—for Wire Welding**
(See WELDERS—Butt and Spot and Machinery —Welding Wire Fabrics)

**MACHINERY—Winding Wire**
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
General Machine Tool Co., Worcester, Mass.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Drawing**
American Laubscher Corporation, New York 19, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Wire and Machinery Co., Cleveland, Ohio
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Takemura Co., Ltd., New York, N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wire Engineering Associates, Inc., South Holland, Ill.

**MACHINERY—Wire Forming**
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Takemura Co., Ltd., New York, N. Y.

**MACHINERY—Wire Rope**
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wrapping with Paper**
American Laubscher Corp., New York, N. Y.
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Company, Boston, Mass.

**MARKING & STAMPING DIES—(See DIES—Marking and Stamping)**
Jas. H. Matthews & Co., Pittsburgh, Pa.

**MATERIAL HANDLING EQUIPMENT—**
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

**NAIL TOOLING—Tungsten Carbide**
Pittsburgh Carbide Die Co., Monongahela, Pa.

**NAILS—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

**NIPPERS—Wire Cutting**
Robinson, M. W. Co., Rockfall, Conn.

**NOZZLES—For Extruding Machines**
Central Tool and Machine Co., Bridgeport, Conn.

**OVENS—Cable Lacquering and Enameling**
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Michigan Oven Company, Detroit, Mich.

**OVENS—Rod Bakers**
Carl Mayer Corp., The, Cleveland, Ohio

**OVENS—Welding Rod Coating**
Carl Mayer Corp., The, Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

**PAILS—Packaging (See Drums—Wire Packaging)**

**PAINT BONDING CHEMICALS—**
Amchem Products, Inc., Ambler, Pa.

**PAINTS—Heat Resisting**
Amchem Products, Inc., Ambler, Pa.

**PAPER—Insulating**
Twitchell, Inc., E. W., Philadelphia, Pa.

**PAY-OUT SYSTEMS—**
(See MACHINERY—Take-Up & Pay-Out)

**PHOSPHATE COATING CHEMICALS**
(See COMPOUNDS—Phosphate Coating)

**PICKLING COMPOUNDS—**
See (Inhibitors—Pickling)

**PLASTICIZERS—**
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.

**PLASTICS—for Wire Insulation**
Apex Tire & Rubber Co., Pawtucket, R. I.
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Thompson Chemical Company, Pawtucket, R. I.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

**PRINTING WHEELS—for Electric Wire**
Frank Daniels & Co., New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

**PULLERS AND GRIPS—For Wire**
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**RACKS—Wire Storage**
Jarke Manufacturing Co., Chicago, Illinois

**REEL AND TENSION STANDS—**
Mettler Machine Tool, Inc., New Haven, Conn.
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

**REEL CRUTCHES—**
Watson Machine Co., Paterson, N. J.

**REELS & SPOOLS—Aluminum Alloy**
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

**REELS & SPOOLS—Annealing and Stranding**
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

**REELS—Metal Bound**
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.

**REELS—Plywood**
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

**REELS & SPOOLS—Steel (All Types)**
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New York Engineering Corp., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

**REELS—Steel, for Rope and Cable**
New York Engineering Corp., Yonkers, N. Y.

**REELS—Wire Mill**
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Boonton Molding Company, Boonton, N. J.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.
Wardwell Braiding Machine Co., Central Falls, R. I.

**REELS & SPOOLS—Wood**
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

**REFRACTORIES—High Temperature**
Norton Company, Worcester, Mass.

**ROD BAKERS—**
(See OVENS—Rod Bakers)

**RODS—Stainless Steel**
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Pittsburgh Steel Co., Pittsburgh, Pa.

**RODS—Wire—Non-Ferrous**
Aluminum Company of America, Pittsburgh, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

**RODS—Steel**
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pittsburgh Steel Co., Pittsburgh, Pa.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**ROLLS—For Flattening Wire**
General Machine Tool Co., Worcester, Mass.

**ROPE—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

**RUST PROOF COMPOUNDS—**
(See COMPOUNDS—RUST Preventing)

**RUST REMOVING COMPOUNDS—**
(See COMPOUNDS—RUST Preventing)

**SATURATION SYSTEMS—**
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

**SOAPS—Industrial and Wire Drawing**
(See COMPOUNDS—Wire Drawing)

**SPOOLS—Plastic**
Boonton Molding Company, Boonton, N. J.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

**STAMPINGS—Steel**
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

**STOCK STORAGE SYSTEMS**
Jarke Manufacturing Co., Chicago, Illinois

**STRIP—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

**TANKS—Ceramic, for Galvanizing**
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)

**TANKS—Compound**
Watson Machine Co., Paterson, N. J.

**TENSION METERS—for Wire**
Boulin Instrument Corporation, Pelham, N. Y.

**TESTERS—INSULATION**
(See MACHINERY—Spark Testers)

**TESTING EQUIPMENT**
(See MACHINERY Testing, Physical and Diameter Testing)

**TINSEL—Electric Conductor**
Montgomery Co., The, Windsor Locks, Conn.

**TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.**
(See TINSEL—Electric Conductor)

**TOOLS—Nail Machine**
Pittsburgh Carbide Die Co., Monongahela, Pa.

**TRAMRAIL SYSTEMS—**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)**

**TRAVERSES & DRUMS—For Reels**
(See Drums & Traverses)

**TRAVERSE MECHANISMS—**
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

**VARNISHES & LACQUERS—for Electric Wire**
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

**VULCANIZING PANS AND EQUIPMENT—**
American Insulating Mach'y Co., Phila, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

**WAXES—for Insulated Wire**
Cary Chemicals, Inc., New Brunswick, N. J.

**WELDERS—Spot and Butt and Welding Wire Fabrics**
Eisler Engineering Corp., Newark, N. J.
Maschinen and Stahl, A.G., Zurich, Switzerland.
Micro Products Co., Chicago, Ill.
National Electric Welding Machines Co., Bay City, Michigan
H. A. Schlatter, Ltd., Zollikon-Zurich

**WHEELS—for Printing on Electric Wire**
Frank Daniels & Co., New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

**WIRE—Aluminum**
Aluminum Company of America, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

**WIRE—Ball**
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

**WIRE—Barbed**
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

**WIRE—Brass and Bronze**
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

**WIRE—Cadmium**
Stamford Processing Co., Peekskill, N. Y.

**WIRE—Cast**
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Clad and Plated**
Sylvania Electric Products Inc., Warren, Pennsylvania

**WIRE—Cold Heading**
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Copper**
Malin & Co., The, Cleveland, Ohio
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.

**WIRE—For Electrical Conductors**
Aluminum Company of America, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.

**WIRE—Flat**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
National Standard Company, Niles, Mich.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

**WIRE—Galvanized**
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

**WIRE—High Carbon**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

**WIRE—Manufacturers**
Aluminum Company of America, Pittsburgh, Pa.
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corporation, Pressed Steel Div., Cleveland, Ohio
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Metalizing**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

**WIRE—Music**
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Worcester Wire Works Div., National-Standard Company, Worcester, Mass.

**WIRE—Needle**
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

**WIRE—Nickel Alloy**
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

**WIRE—Nickel Silver and Phosphor Bronze**
Malin & Co., The, Cleveland, Ohio
United Wire & Supply Corporation, Providence, R. I.

**WIRE—Oil Tempered**
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

**WIRE—Special Shapes**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
National Lock Washer Company, The, Newark, N. J.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

**WIRE—Spring**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's John A., Sons Corp., Trenton, N. J.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Stainless Steel**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

**WIRE—Steel—Also Coppered and Galvanized Steel**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Straightening and Cutting**
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

**WIRE—Zinc**
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

**WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.**

**WRAPPING PAPER—Creped**
(See PAPER—Creped Wrapping)

**YARN TESTERS—**
Scott Testers, Inc., Providence, R. I.

**YARNS—Wire Insulating**
Synthetic Thread Corp., Bethlehem, Pa.

# The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

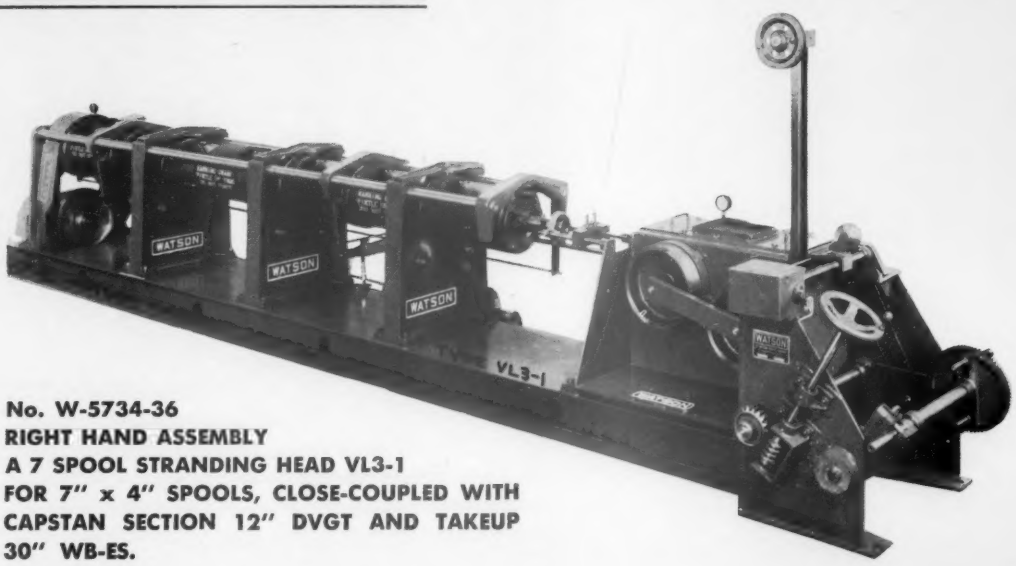
WATSON

# EXTRA HIGH SPEED STRANDERS TYPE "VL"

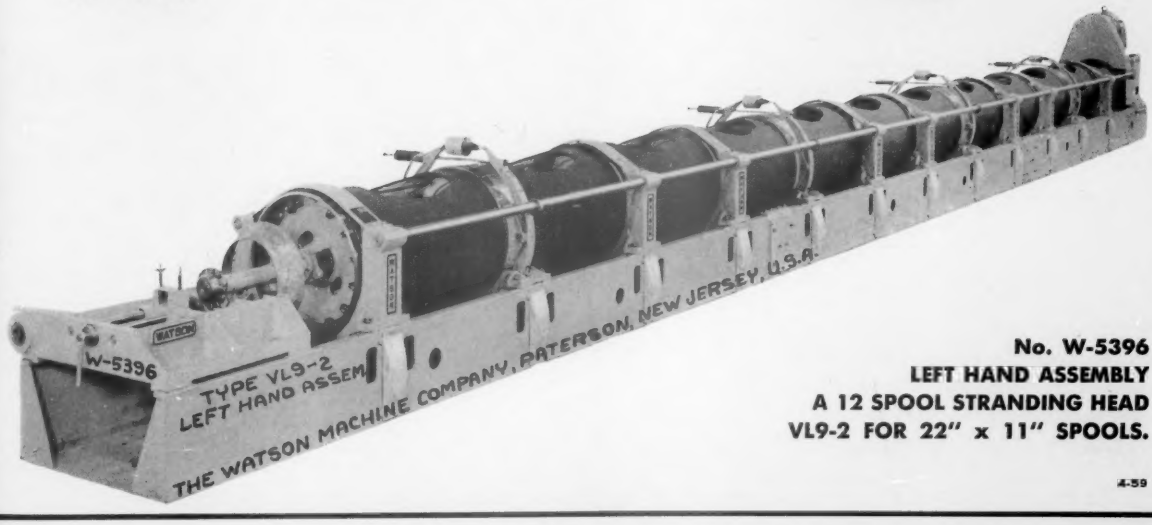
U. S. Patents 2,442,817 & 2,690,642

**THESE MACHINES ARE BREAKING PREVIOUS PRODUCTION RECORDS AND THEIR QUIET, "HIGH SPEED WITH SAFETY" PERFORMANCE HAS SET NEW STANDARDS WHEREVER THEY OPERATE.**

**AVAILABLE IN MANY SIZES FOR SPOOLS FROM 3-3/4" DIAMETER (5 POUND) TO 24" DIAMETER (1,000 POUND), THE LATTER PARTICULARLY EFFICIENT IN "PRESTRESSED CONCRETE STRAND" PRODUCTION.**



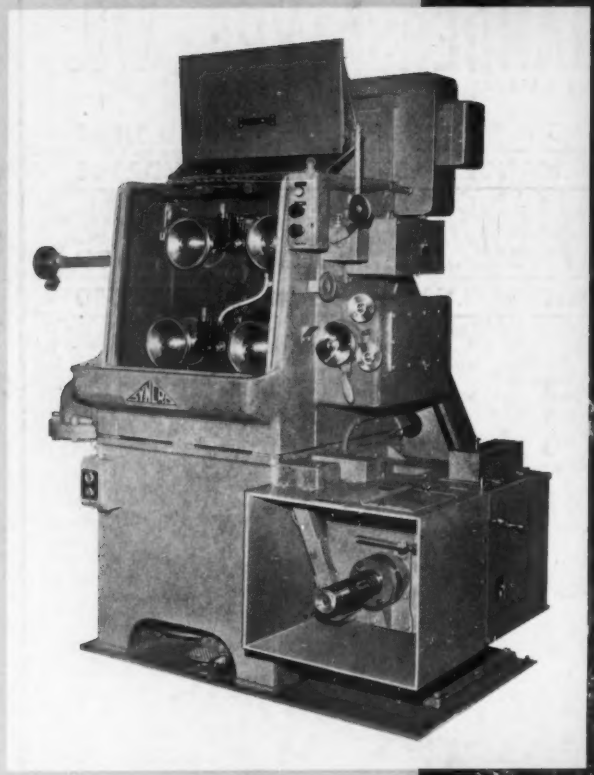

**No. W-5734-36**
**RIGHT HAND ASSEMBLY**
**A 7 SPOOL STRANDING HEAD VL3-1**
**FOR 7" x 4" SPOOLS, CLOSE-COUPLED WITH CAPSTAN SECTION 12" DVGT AND TAKEUP 30" WB-ES.**




**No. W-5396**
**LEFT HAND ASSEMBLY**
**A 12 SPOOL STRANDING HEAD VL9-2 FOR 22" x 11" SPOOLS.**

4-59

# new... 6000 F.P.M. ...wire drawing machine



Model BG-16 . . . A new measure of Syncro Machine Company's superior design. BG-16 is a 25-horsepower non-ferrous wire drawing machine offering a finished range of copper wire sizes from 19 to 34 B&S gauge, and operating speeds up to 6000 F.P.M. This machine can be supplied with a standard 100 pound capacity model B Spooler (as shown) or larger spoolers to meet specific production requirements. Improved die holders with new reciprocating mechanisms are individually piped to receive solution from the main source of supply. In addition to high speed and heavier capacity, the new all-gear-drive unit incorporates an externally-mounted force-feed lubrication pump with a safety interlock. This pace setting machine serves as another reason why—when drawing wire—it pays to specify Syncro.

## THE MEASURE OF SUPERIOR DESIGN

## THE MARK OF QUALITY

SYNCRO

**SYNCRO MACHINE COMPA**

Perth Amboy, New Jersey, U.S.A.

affiliated company: WINGET SYNCRO Ltd. Rochester, Kent, England

*Better Machinery for the Wire Industry*

WIRE DRAWING MACHINES • STRANDERS • CONTINUOUS ELECTRIC ANNEALERS • PAYOFFS • CAPSTANS • WIRE INSULATORS • HEAVY DUTY TAKEUPS • TAPERS • SPECIAL MA